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REPORT

ON THE OPERATIONS OF THE

DEPARTMENT OF AGRICULTURE, BENGAL,

FOR THE YEAR

1919-20.

CALCUTTA :

THE BENGAL SECRETARIAT BOOK DEPOT.

1921.

[*Price, Rs. 3-10.*]

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DEPARTMENT OF AGRICULTURE, BENGAL.

No. 7141A.

FROM R. S. FINLOW, ESQ., B.SC., F.I.C.,
Director of Agriculture, Bengal (offg.),

TO THE SECRETARY TO THE GOVERNMENT OF BENGAL.
REVENUE DEPARTMENT.

Dated Dacca, the 5th July 1920.

SIR,

I have the honour to submit the Annual Report of the Agricultural Department, together with the reports of the expert officers, for the year 1919-20.

I have the honour to be,
SIR,
Your most obedient servant,
R. S. FINLOW,
Director of Agriculture, Bengal (offg.).

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REPORT

OF THE

AGRICULTURAL DEPARTMENT, BENGAL,

FOR

1919-20.

INTRODUCTORY.

Last year, in addition to the Director's review and the Experts' reports, the reports of the Superintendents of Agriculture, as well as Farm reports, were included in the same volume. In obedience to Government orders on the subject, the present volume only contains the Director's review, Experts' reports and the Farm reports. The reports of the Superintendents of Agriculture have been incorporated in those of the respective Deputy Directors of Agricuture.

SECTION I.—AGRICULTURE.

Administration.—I officiated as Director, in addition to my own duties as Fibre Expert, throughout the year, except for the period from 1st April to 13th May, when Mr. Milligan was in charge of the Department. Mr. K. McLean and Rai Rajeswar Das Gupta Bahadur continued as Deputy Directors of Agriculture, Eastern and Northern Circles respectively. Mr. Smith, Deputy Director of Agriculture, was on leave during the whole year, and Rai Rajeswar Das Gupta Bahadur held charge of the Western Circle in addition to his own duties. Mr. Hector remained in charge of the office of Economic Botanist, and also acted as Agricultural Chemist up to 15th December 1919, when he made over charge of these offices to Mr. K. McLean, in order to officiate as Imperial Economic Botanist at Pusa. Mr. N. Gupta did the work of Personal Assistant to the Director till 21st May 1919, when he was succeeded by Babu Jyotish Chandra Roy. Mr Hari Prasad Mitra held the post of the Superintendent of Agriculture, Presidency Division till the 27th May 1919, when he proceeded on special

duty to Bankura, in connection with paddy investigations. He was relieved by Dr. N. Gupta. Babu Bhabatosh Dutta of the Subordinate Agricultural Service was appointed, in May 1919, to act as Superintendent of Agriculture in the Rajshahi Division, in consequence of the services of Mr. J. N. Chakraborty being placed temporarily at the disposal of the Assam Administration. There was no change in the personnel of the superior staff of the Sericultural Section. The Services of Mr. N. N. Pillai, Weaving Expert, were transferred to the newly constituted Department of Industries with effect from the 1st December 1919.

During the year, new appointments in the District Agricultural Officer's grade were sanctioned for the Amarpur Middle English School at Burdwan, and for the Agricultural Vernacular School, Dacca. The permanent strength of the subordinate Agricultural Service, which consists of Farm Superintendents and District Agricultural Officers, was therefore increased from 31 to 33.

Tours.—Mr. Milligan was on tour for 10 days and I was away from headquarters for 137 days. Mr. McLean spent 127 days on tour and Rai Rajeswar Das Gupta Bahadur 172 days in the Western Circle and 67 days in the Northern Circle. Mr. Hector was in the districts for 90 days. The Superintendents of Agriculture and the District Agricultural Officers spent a considerable portion of their time on tour.

Agricultural Education.

The Principal of the Agricultural College at Sabour reports that during the session 1919-20 there were 43 students from Bengal, of whom 28 were in the first year class and 15 in the second year class. Of the students in the 1st year and 2nd year classes, 4 and 1 respectively left the College before the Annual Examination. Of the remainder, 10 passed the certificate Examination and 17 the 1st year's Annual Examination, in March 1920. Three Scholarships were awarded by the Government of Bengal. Of these 2 were held by students in the 1st year class and one in the 2nd year class. One of the first year students has been removed from the College, as he failed to pass the Annual Examination. The Bengal students included holders of 8 Scholarships, awarded respectively by the District Boards of Mymensingh, Pabna, Jessore, Tipperah, Chittagong, Noakhali and Bankura; besides a special scholarship granted by the Bengal Educational Department. As in the previous three years, the Maling Grant Scholarship remained vacant, there being no student from the St. Andrew's Colonial Homes, Kalimpong, to take it.

Reports have been received from the Educational Department, regarding the progress of nature study in primary schools, and the Agricultural classes in secondary schools. It appears that lack of properly trained teachers, as well as of gardens, has prevented serious progress anywhere.

A considerable recrudescence of public opinion in favour of agricultural education in schools appears to be taking place. The question is one which has been under consideration for a number of years. As far back as 1901 proposals were made at an Educational Conference at Simla, for affording increased facilities for agricultural education to various classes of the community, and as an experiment, Government sanctioned the opening of agricultural

classes in several secondary schools in Bengal. The results have been unsatisfactory, and much the same applies to attempts to introduce nature study into the curricula of primary schools. In 1917 Government sanctioned the payment of a capital grant of Rs. 1000, and a recurring grant of Rs. 50 a month for 2 years, to the Methodist Episcopal Church at Asansol, for conducting agricultural education in the Burdwan District, under the supervision of the Agricultural Department. The grant of Rs. 50 per month has been renewed for another two years from 1st August 1919, the charge being met from the Budget of the Director of Public Instruction.

The subject of agricultural education was again discussed at a conference on Agricultural Education at Simla in 1917, when the establishment, as an experiment, of one or two Vernacular Agricultural Schools in each Province was advocated. This suggestion resulted, as far as Bengal is concerned, in a decision to open two agricultural schools, at Dacca and Chinsurah respectively.

The Dacca School commenced its first session in January 1920 with a full complement of 15 Muhammadan and 15 Hindu pupils. Unavoidable delay in the building operations have postponed the opening of the Chinsurah School until January 1921. The object of these schools is to provide instruction for the sons of cultivators, without inducing in them a desire to desert their traditional calling. A sound elementary education is combined with facilities to become familiar with up-to-date methods of cultivation, and to appreciate the advantages of improved seeds, implements and manures. In the workshops the students will be taught to make and repair ordinary agricultural implements.

At the same time the teaching of Agriculture in two secondary schools viz., at Amarpur, Burdwan District, and at Durgapur, Chittagong District, is being revived as an experimental measure. Both these schemes are practically entirely financed by local effort. At Amarpur Babu Manmatha Nath Pal has invested Rs. 20,000 in War Loan Bonds for the maintenance of the school, and has provided a suitable area of land as a demonstration farm. He has also erected a seed store. In this case Government have agreed to appoint a District Agricultural Officer to Amarpur, who will teach agriculture to the students. He will also be in charge of the seed store, and of the demonstration area.

A somewhat similiar offer of 40 bighas of land, and a large pucca house already being used as a school and capable also of accommodating a seed store and office, has been generously made by Babu Chuni Lal Bag of Mahisadal, Tamluk, Midnapore District. Several other schools have already intimated their anxiety to commence the teaching of Agriculture, provided financial assistance can be obtained from Government. The chances of success at Dacca, Chinsurah, Durgapur and Amarpur are, on account of better trained and better paid teachers being employed, considerably brighter than in the case of the older efforts; nevertheless, in view of past failures, it would obviously be unwise to spend large sums of public money in this direction, before the experimental schools have yielded results on which a forward policy can be based. In other words, to quote from His Excellency the Governor's speech at Rajshahi in August 1919, "It is premature to extend the experiment."

Another aspect of the activities of the Department of Agriculture, in the direction of education, is the proposed establishment of an Agricultural Institute at Dacca. This scheme, which was put forward by Mr. Milligan and approved by the Calcutta University Commission, aims at giving a thorough practical training in agriculture to young men who have already been through a course in pure science. The capital cost of the Institute will be met from a special grant by the Government of India, and the staff will include a first class Agriculturist, a competent Engineer and a Botanist, each with an adequate number of assistants. An area of 300 acres, adjacent to and north of, the Government Central Farm at Dacca has been acquired as the site of the Institute, and plans and estimates are well on the way towards completion. Beyond lectures on plant breeding, farm accounts and surveying, the course will consist almost entirely of practical instruction. The equipment of the Institute will include mechanical appliances of various kinds for the cultivation of land, and good workshops, where students will gain a sound practical knowledge of the engines, pumps and other implements which are in use. There will also be a dairy, and the syllabus provides for instruction in the feeding and management of cattle. An extensive irrigation system will be used, to demonstrate the importance of irrigation in high land, in assisting the growth of valuable crops like sugarcane, and on helping to solve the cattle fodder question, which is becoming so acute in densely populated Bengal.

Research and Experiment.

Fibres, Jute.—While no new work was initiated during the year under review, considerable progress was made with the investigations already in hand. An inquiry into the cause of *chlorosis* in jute was commenced by the Economic Botanist. In the meantime the non-chlorotic races of *Corchorus capsularis* continued to assert their superiority over those having a tendency towards *chlorosis*. By reference to the Fibre Expert's report, it will be seen that two non-chlorotic strains of *Corchorus capsularis* now head the list, having definitely beaten *Kakya Bombai* in the matter of fibre-yielding capacity. Freedom from *chlorosis* has been decided on as one of the essential factors of pure line selection with jute.

In the last season there was sufficient *Kakya Bombai* growing in the districts, to enable quantities of it to be bought up, with a view to spinning trials in the mills. This was done, through the kindness of Mr. Suttie of Messrs. Sinclair Murray & Co., at several of the agencies of the firm. The fibre thus purchased was forwarded to Messrs. Thomas Duff & Co., Calcutta, on behalf of whom the Hon'ble Mr. A. R. Murray has kindly undertaken to make the tests in the Company's mills.

At the Dacca and Rangpur Farms, and also on plots lent by Messrs. Sim & Co., of Narayanganj, departmentally selected seed was compared with seed procured by Messrs. M. David & Co., of Narayanganj, from Fanduk and Simulkandy. As will be seen from the Fibre Expert's report, the yield of the latter compared very unfavourably with that of the departmental seed, being always several maunds per acre less.

Corchorus olitorius.—During the year the most important work was the repetition of the previous year's comparative tests between the two pure

lines "R. 26" and "Chinsurah Green." The former is the departmental selection which had, before 1918, given most satisfactory results. In 1918-19, however, when "Chinsurah, Green" came into the tests for the first time, it gave yields, both at Rajshahi and Chinsurah, which were several maunds per acre better than those of "R. 26." The experiments were repeated in 1919-20 at Dacca, Rajshahi and Chinsurah, with the result that, on the average, "Chinsurah Green" was nearly 5 maunds (400 lbs.) per acre better than "R. 26". It is obvious that, in "Chinsurah Green", the Department has discovered a race of *Corchorus olitorius* which has an outstanding yielding capacity.

Water Hyacinth—It was not possible to do a large amount of work with Hyacinth during the year; but the Deputy Director of Agriculture, Eastern Circle, carried out some interesting experiments with a view to ascertaining the amount of labour involved in completely clearing water infested with the plant. Tanks were used for the purpose: and clearing of the plant was done in them at respective intervals of (*a*) two weeks, (*b*) a month and (*c*) 2 months. The experiments are being repeated in the present year, and other trials designed to compare different methods of clearing, are also projected.

Botanical Section, Rice—Oryza sativa.—The work on rice, details of which will be found in the Annual Report of the Economic Botanist, was on much the same lines as the previous year. Three new heavy yielding pure lines of transplanted paddy had been multiplied sufficiently for a field test against Indrasail. One of these, *Dudsar*, a race almost exactly similar to *Indrasail* gave a slightly better yield than the latter, and it also ripens rather earlier. If these results are confirmed in due course, the new race will be of particular value in places where moisture is deficient in the later stages of growth of the crop. For instance, at Chinsurah, Indrasail is probably unable to do itself justice in two years out of five, owing to lack of moisture in the interval between flowering and ripening of the grain. A race which is as heavy a yielder as *Indrasail* and which matures a fortnight earlier would have a decided advantage. The matter is of course of still greater importance in the westerly districts of Birbhum and Bankura. In this connection, it may be mentioned that cross-fertilization experiments are in progress, to see how far it is possible to unite the qualities of heavy yielding capacity and early maturity in one hybrid plant. Such work is extremely laborious in nature; but its object, and the value of the latter if achieved, to tracts like the Burdwan Division, which so frequently suffer from short moisture at the end of the season, will be patent to all.

Aus paddy.—The pure line *Kataktara* has continued to give satisfactory results over a large proportion of the province, and the demand for the seed is much greater than our supply. At Rajshahi, however, the results were not satisfactory, and this is being investigated. At Dacca *Kataktara* was crossed with early ripening *aus* rices and early ripening *aman* rices, as also with *Indrasail*; the object being as described in the preceding paragraph.

The experimental cultivation of *Kataktara*, which is a broadcast high land rice in Eastern Bengal, as an early ripening transplanted rice, was continued in higher rice lands in Bankura with successful results, on which

the District Agricultural Officer is to be congratulated. A demand for *Kataktara*, as a transplanted *aus* rice, is already springing up in the tract. Mr. H. P. Mitra was placed on special duty at Bankura with the object of investigating this problem, the importance of which was pointed out in last year's report. Unfortunately he was away on medical leave during practically the whole of the paddy season.

Comparative field tests at Dacca between *Kataktara* and *Sujamukhi* ended considerably in favour of the former. The advantage of the straw of the latter remaining green when the grain is ripe is thus discounted.

Cotton.—Experiments with cotton are in progress at the four principal farms with a view to a thorough and final investigation of this long standing problem. So far the results, with a possible exception in Rajshahi, are not encouraging.

Chemical Section—Provincial Soil Suvrey.—This, and problems connected with it, have formed practically the whole work of the chemical section during the year, excepting for two months, when the staff were occupied with cyclone relief work. The analysis of the soils of various experimental plots at the farm has now been completed; ash analyses of crops grown on these plots have also been finished, and attention is again being turned to soil samples from the districts. During the year considerable trouble, resulting in the loss of a good deal of time, has again been met with owing to impurity of reagents.

Sugarcane.—The crop on the Dacca Farm was so damaged by the cyclone in September 1919 as to be useless for comparative purposes. A year was thus lost, and only sufficient cuttings could be obtained for carrying on the tests this year. Several new exotics from Australia, Java and Demarara have been added to the collection and are being multiplied during the present season.

At Rajshahi the *Tanna* canes again led the way, and justified their selection for distribution. The same was the case at Chinsurah, where the superiority of *Yellow Tanna* was very marked. Practically 5 tons of gur (137 maunds) per acre, were reaped off one plot at the latter farm, and the average yield over 13 plots was 3·8 tons (108 maunds) per acre.

Entomology.—As in previous years, the Imperial Entomologist, Pusa, rendered necessary assistance in the way of identifying pests, suggesting remedial measures &c.

The Entomological Collector, in collaboration with the Mycological Collector selected, against disease, all the sugarcane setts for the experimental plots at Dacca. His work on the life history of the mango weevil may make it possible to produce fly-free mangoes in Eastern Bengal.

Mycology.—The first and second Imperial Mycologists continued to collaborate with the Fibre Expert in the investigation into the "black band" disease of jute, *Diplodia corchori*. It now appears to be quite definite that the disease does not seriously attack either young crops, or late sown crops; but that the earlier the seed is sown, the more liable is the resulting crop, if it is kept for seed, to suffer from *Diplodia* in the later stage of its life, when the seed is maturing. This is particularly the case with a well grown crop—more so than

with one of comparatively stunted growth. It is satisfactory to note, that there is practically no danger from damage by *Diplodia* to crops intended for fibre production. It may now be considered to have been definitely proved that the fungus is wide spread; also that if the above conditions are observed *i.e.*, if sowing be not too early, a perfectly healthy seed crop may be raised. A large amount of analytical investigation has been done, both on soils and on the ash of infested and healthy plants, and there are indications that the attack of *Diplodia* may be associated with chemical conditions in the soil in which the crop is growing. Such indications are, however, very indefinite at present and a good deal more work is necessary.

Collaboration also continues between the Imperial Mycologist and the Fibre Expert in an investigation into the cause of the wilt disease of rahar (*Cajanus indicus*).

Agricultural Stations.—The improvement of the existing farms continues on lines previously laid down, and good work has been done in the past year at the Demonstration Farm, Rangpur, the tobacco farm Burirhat and at Burdwan; also at Chinsurah, as well as at Dacca.

During the year, the first three new district farms, viz., those at Mymensingh, Bogra and Comilla, have been completed and are now at work. Other farms at Birbhum, Pabna and Backarganj will be largely, if not completely finished within the current year; while operations have commenced on others again in Murshidabad, Bankura, Faridpur, Jalpaiguri and the Chittagong Hill Tracts. It is most satisfactory to note that offers of free sites, and often annual subscriptions in addition, continue to come in from District Boards. During the year an officer has been appointed to take charge of the farm at Gosaba, generously presented to the Department by Sir D. Hamilton. It should be mentioned that, under Government Orders, the building of all these farms has been handed over to the Public Works Department, a wise provision. The handing over has caused some little temporary delay but this only refers to the farms in the programme for the present year. On the other hand, the Agricultural Department will be relieved of the supervision of building work, which will enable the officers concerned to engage their attention in more legitimate duties.

Cattle Breeding.—The work at the Rangpur Cattle Farm has been vigorously prosecuted during the year under review. Apart from the completion of additional accommodation, the second weeding out process of undesirable animals has been carried out, under the advice of Mr. Henderson, Imperial Agriculturist. A definite standard of milk production has been laid down which will be raised as the work progresses.

The selected herd already shews improvement, and although there is still a good deal to do, it is satisfactory to record that progress is undoubtedly being made. The herd still consists of two sections, in which a *desi*, and an imported *Hansi* bull, respectively, are being used.

District Work.

The development of interest in agricultural matters, noted in last year's report, continues, and correspondence with unofficial gentlemen interested in agriculture is increasing.

At the end of last year there was a District Agricultural Officer in each district as well as several temporary officers appointed for special work. The total number of District Agricultural Officers and Sub-Divisional Officers is 33, but there are urgent demands for more, and the numbers will be increased as funds become available.

The number of permanent demonstrators is now 79. Hitherto these men have been recruited on a temporary basis; but Government has recently created a permanent cadre of demonstrators with an incremental scale of pay. The method of recruiting will be from apprentices trained at the farms, and selection will be made by a simple examination, largely of a practical nature. It is the policy of Government to gradually increase the number of demonstrators until there is one in each police thana i.e. a total of 670. In view of the rapid development of the work of the Department there is urgent necessity of a considerable immediate increase in the number of these officers.

It is not to be forgotten that, in addition to the District Agricultural Officers and the Demonstrators belonging to the Agricultural Department, one Agricultural Overseer (corresponding to District Agricultural Officers), and several Agricultural Sub-Overseers (corresponding to Departmental demonstrators) have been appointed by District Boards, Khas Mahal Estates and Court of Wards Estates. An Agricultural Overseer is employed by the District Board of Hooghly, and 35 Agricultural Sub-Overseers are retained by District Boards, Wards Estates and Khas Mahal Estates. Of these 7 are employed by the Midnapur District Board and six each by the Barisal Ward-Estate and Khas Mahal Estate respectively.

The work of the district staff comprises demonstrations of the improvements which the Agricultural Department recommends, as the result of experiment. As a rule the demonstration period is a short one, for the cultivator now shews less diffidence in accepting advice offered to him by Departmental Officers.

The programme of demonstration includes improved varieties of rice, jute, sugarcane and tobacco; the use of bonemeal, potash and lime as manures; the cultivation of *dhaincha* (*Sesbania aculcata*) as a green manure before paddy; and the cultivation of groundnut and potatoes where conditions are suitable.

In the case of improved races of rice, jute and sugarcane, the difficulty is now to produce a sufficient quantity of seed to satisfy the demand for it. It is impossible for the Agricultural Department to supply very large quantities of any kind of seed and, pending the development of private enterprise in this direction, it is necessary to make what seed is available go as far as possible. To this end Mr. Milligan, after much consideration, decided on what is, in effect making the cultivator doing the last multiplication of seed himself. The system is described in last year's report.

Distribution of small quantities of the seed of varieties of jute—Kakya Bombai —About 1,500 maunds (55 tons) of the seed of *Kakya Bombai* were raised in the season 1918-19, of which nearly 1,000 maunds (36 tons) were sold while about 600 maunds (22 tons) were distributed in $\frac{1}{4}$ lb packets to cultivators throughout the Chittagong, Rajshahi and Dacca Divisions. It is estimated that about 50 per cent of the people who received seed, kept the resulting crop for seed, and the area of *Kakya Bombai* grown in the season 1919-20 was 60,000 acres in the Dacca district alone, while there was a total of

135,000 acres in the Dacca and Chittagong Divisions. In the Rajshahi division 661 maunds of *Kakya Bombai* seed have been distributed in the last two years, and here again roughly 50 per cent of the people who received seed grew a seed crop. A conservative estimate therefore places the probable total area of *Kakya Bombai* jute as approaching 200,000 acres in the present season 1920-21 ; and this has been attained for an expenditure of about 1,500 maunds of seed. If such a quantity of seed had been sold in the ordinary way, the result would have been an area of only about 12,000 acres. In other words, for the purpose of increasing the area under *Kakya Bombai* jute the system multiplies the efficiency of available seed about 18 times, and is therefore, justified by the results.

In the present season, partly because a new strain of seed, which is apparently an even heavier yielder than the original *Kakya Bombai*, is being multiplied for distribution, and partly because of an anticipated increased demand in the cyclone affected tract, no seed was distributed and the whole produce of about 1800 maunds (66 tons), was sold. Of this, 1575 maunds were sold in Eastern Bengal, chiefly in the Dacca District, and 330 maunds in the Rajshahi Division. There was a great demand for the seed at prices which were substantially higher than—in some cases as much as 50 per cent above—those being paid for local seed. Another report states that, as long as Departmental seed was in the market, local seed found no sale, even at lower rates. The price charged for the seed in Eastern Bengal was Rs. 20 per maund which just covered the cost of production. It is probable that this price will have to be raised, as the area under seed jute in Bihar has, chiefly, owing to competition from sugarcane, seriously decreased in the present season. It seems certain that the cultivator is beginning to realize that it is worth while to pay a high price for superior seed, and when the Department has taught him this, there will be a lucrative opening for the private seedsman of the type which exists in Britain. As an instance, if a cultivator pays annas 12 per seer for good jute seed instead of annas 4, and sows 5 seers (10 lbs) per acre, the extra cost of seed is Rs 2-8 per acre. If, as a result of using this seed, he reaps 2 maunds more fibre per acre, worth say Rs. 7 per maund, it is obvious that he is a substantial gainer.

Corchorus olitorious.—About 200 maunds of the seed of the pure line "R. 26" were produced in 1918-19, and about 170 maunds of seed were distributed for multiplication to about 14,000 cultivators. In the present year no seed of *Corchorus Olitorius* has been distributed, as it is expected that sufficient seed of " Chinsurah Green," a much heavier yielder, will be available for distribution next year.

Transplanted Aman Paddy.—The distribution of the seed of the variety *Indrasail* is made in 5 seers (10 lbs) packets, on condition that an equivalent amount is returned after harvest. A total of about 4800 maunds was put out in this way in 1919-20. The rate of increase of the area under departmental paddy has, however, not been so satisfactory as in the case of jute. The probable reason is that paddy is the principal food-stuff, and that, in the period of comparative scarcity during the last two years, cultivators have kept all surplus stocks for consumption, instead of selling or exchanging the seed for cultivation elsewhere. The result is that the total area under *Indrasail* probably remains in the region of 100,000 acres instead of being more than double this figure. Nevertheless although the unprecedented conditions

have rendered the system less efficient than it would otherwise have been, the rate of increase is still several times greater than if the seed had been sold in the ordinary way ; the system is thus amply justified.

It is worth remembering that *Indrasail*, as a fairly late maturing paddy requires good moisture until a late period of the year. It does not therefore do well on the higher lands, or in any circumstances where the soil is liable to dry out soon. This is strikingly exhibited in the terraced paddy lands of Western Bengal, where *Indrasail* and *Nagra* gave very good results in the lowest terraces, but would not yield grain in the higher ones. It is in the latter that *Kataktara* paddy is proving so satisfactory.

Kataktara Aus Paddy.—In Eastern Bengal the results with this pure line of broadcast high land rice have been extremely good, and the demand for seed is now much greater than can be met. The same applies to Western Bengal where, as has already been stated, *Kataktara* is giving good results as an early transplanted rice, in the higher terraced paddy lands of Bankura, Birbhum and Midnapur.

Nagra Paddy.—This is a common rice in the districts near Calcutta. It is now being subjected to pure line selection by the Economic Botanist; but the ordinary seed has been grown at, and distributed from, Chinsurah for some years by the Deputy Director of Agriculture, Western Circle. It is a heavy yielder ; though perhaps under the best conditions not so good as *Indrasail*. On the other hand it matures about 2 weeks earlier than *Indrasail*, and in a tract like Western Bengal, where the moisture so often runs short at the end of the season, *Nagra* and the selections from it, are likely to serve a useful purpose.

Groundnuts.—In the Burdwan Division the cultivation of this valuable crop continues to expand, and demonstrations have been extended to the Presidency Division, more especially to the poor light high lands of the Nadia District.

Tobacco.—In the Rangpur district, as a result of the work of the Burirhat Farm, cultivators have commenced to grow Sumatra tobacco, the area under which reached 100 acres in the year under review, as against 20 acres in the previous year. The leaf produced at the Burirhat Farm is sold for high prices as wrapper leaf, the preparation of which entails not only careful cultivation, but also very careful curing. A special officer was appointed to assist cultivators in carrying out the fermentation and curing processes, and considerable assistance was also rendered in this direction by the Rangpur District Agricultural Association. A Co-operative sale society has now been formed among growers of Sumatra tobacco, in order to enable them to procure the best market for their produce.

Tobacco has also become an item in the demonstration programme for Eastern Bengal and encouraging results are being obtained.

Sugarcane.—The keen demand for the *Tanna* cane continues, and it is at present impossible to supply the demand for setts. However, now that tentative decision has been arrived at regarding a suitable cane for distribution, it has become possible to plant a larger area of *Tanna* on the farms. For instance, there are nearly 10 acres of *Tanna* at Rajshahi in the present season. Moreover each reliable person to whom setts are supplied, becomes a potential supply centre, whence setts can be purchased by intending growers. Thus the supply of setts should increase considerably each year.

Cotton.—The results obtained in the past year have borne out what was said in last year's report. It has already been remarked, in an earlier paragraph, that experiments with cotton have been laid down at the principal farms in the province, and until the results from these are available—they are not encouraging so far—it is not only useless, but dangerous, to make this crop an item in district work.

Manures.—In the Burdwan Division the use of bonemeal for transplanted paddy is extending. 106 tons were actually bought by cultivators, but the demand was for considerably larger quantity, which could not be supplied.

The practice of green manuring for paddy is also spreading in the Western Circle.

Agricultural Associations.—In June 1919 a Government Resolution was issued, in which the agricultural policy of Government is briefly described, and dealing with the necessity for private effort as an adjunct to the propaganda work of the Agricultural Department. To this end the formation of small agricultural associations, serving thanas or even smaller areas, is advocated, for the testing of suggested improvements; the discussion by members of their successes and failures; and to bring their needs to the notice of the Agricultural Department.

The district of Birbhum still leads the way in regard to popular interest in agriculture, and the late Collector Mr. G. S. Dutt, I. C. S. is to be congratulated on the further developments which have taken place under his guidance. Beginning in the year 1916-17 with a movement to decentralize and expand the work of the District Agricultural Association, there were as a result, in 1919-20, 87 branch associations, whose activities extend to practically every phase of agricultural work. Besides the issue of a journal the "*Bhumi Luxmi*", and the opening of agricultural night classes in Middle English Schools, other items include the use of bonemeal, the introduction of groundnut cultivation; green manuring for paddy and the re-excavation of old irrigation tanks. The latter is a clear instance of co-operative action, and as irrigation is often of supreme importance to the paddy crop in Western Bengal, it is to be hoped that the practice of making new tanks and of re-excavating old ones will extend widely. The Bankura District Agricultural Association, under Mr. J. Vas, I. C. S., is also showing considerable energy in regard to agricultural improvement. In addition to Sub-Divisional and *thana* associations, several union associations were started during the year, and the programme, which also includes irrigation schemes and a journal, is naturally similar to that of Birbhum.

During his short stay in Burdwan Mr. Birley had already galvanized the district into considerable agricultural activity, one of the forms of which was the appointment of two or three agricultural Sub-Overseers by the District Board, on a guarantee that a portion of the cost would be met by the Agricultural Associations. Altogether there are now nearly 200 Branch Associations in the Burdwan Division.

Other District Associations in Western Bengal continue to carry on experiments and demonstrations through their members; but development cannot be really satisfactory until the number of demonstrators is increased. In Northern Bengal, new Agricultural Associations in Pabna and Natore have been formed during the year, and 21 rural associations have

also been established, of which 10 were in the Rangpur district. The Rangpur District Association entertained two agricultural demonstrators and one Overseer for *eri* silk rearing. Its members also brought about an increase in the area under Sumatra tobacco, and set up curing sheds, besides advancing money to cultivators, and helping to procure a market for the produce.

In Eastern Bengal there are now over 100 rural associations; 53 of these are in Faridpur and the remainder are divided between each of the remaining districts of the Dacca and Chittagong Divisions. There are 11 demonstrators in Faridpur which is the equivalent in Eastern Bengal of Birbhum; though the work to be done in Faridpur is probably less varied than in Birbhum. Of the rural societies in Eastern Bengal, it is estimated that about half are really justifying their existence; 25 per cent. are doing some work while the remainder have done nothing. Mr. J. N. Roy, Collector of Faridpur, who takes considerable interest in the rural societies in his district, has been largely responsible for the publication of a local journal the "*Krishi Katha*."

It is, of course, possible to improve the associations, and experience has already indicated directions in which this may be done. A Sub-Divisional Association has recently been started in Madaripur, which is intended to amalgamate the interests of rural associations in the Sub-divisions.

It should be mentioned that a District Agricultural and Industrial Association is in process of formation in Chittagong.

Agricultural Activities of District Boards, Khas Mahal and Court of Wards Estates :—The District Boards of Faridpur, Pabna and Bakarganj have presented sites for District Farms, and the two latter are also subscribing towards recurring expenditure of the respective Farms. The District Boards of Midnapore, Rangpur, Hooghly and Burdwan are employing officers of their own to carry out demonstrations of improved agricultural practice as recommended by the Agricultural Department. It has been laid down by Government that Khas Mahal Estates shall, as far as possible, act as models to private estates, by carrying out demonstrations etc., through their own officers, under the advice of the Agricultural Department. Khas Mahal and Court of Wards' Estates are offering help in popularizing the use of improved seed, manures etc., and some of these estates, notably the Tagore Estate and the Khas Mahal Estates in the Bakarganj District, employ their own officers. The Jalpaiguri Khas Mahal Estates have provided land for a District Farm, as well as a money subscription, and Jessore Khas Mahals have offered land. In Bogra, the Mymensingh Court of Wards has offered land for, and also a subscription towards, a farm on the Paikar estate. As a preliminary, demonstration plots have been started on this estate. Similarly in Rajshahi the Midnapur Zemindary has provided land and facilities for demonstration plots.

Exhibitions :—During the year the Department assisted at a number of agricultural exhibitions, among the chief of which were the Calcutta Peace Celebration Exhibition, the Suri *Mela* and the Social Service Exhibition at Dacca. It is hoped to hold a small exhibition annually in connection with each Government Farm, and to give small prizes for improved produce. The development of such a policy, in which the actual cultivator competes with his neighbour in the raising of good produce, will lift the agricultural

exhibition in Bengal out of being a merely passive show, as it is at present, and make it, like British exhibitions, into an active attempt to encourage the cultivator into the path of improvement. Such exhibitions are, through competition, a real incentive to progress.

Sale of Rabi seed in Northern Bengal :—As a result of the relief operations in the Rajshahi district in 1918 it was reported that there was a demand for good *rabi* seed in the Rajshahi Division generally. It was therefore decided to attempt to supply the demand, and preliminary work commenced as early as July, 1919.

A survey was made by the Deputy Director of Agriculture, Northern Circle and his officers, during which orders were booked on the understanding that cash payment would be made on delivery of the seed ; at the same time samples of the kinds of seeds required were taken. These samples were taken to Messrs. Ralli Brothers, who matched them and then submitted samples of the bulk seed for germination tests. The latter were done at Dacca and found to be satisfactory. Twenty-nine distributing centres were opened throughout the seven districts of the Rajshahi division, and each store was in charge of either a departmental demonstrator, or a Khas Mahal, Court of Wards or District Agricultural Association, Officer. The seed was in due course despatched from Calcutta to the respective centres and the total sales amounted to about 1,800 maunds of seed, worth about Rs. 13367 only. Practically the whole of this seed was sold and the proceeds, excepting Rs. 50, duly deposited in the Treasury.

Credit is due to the Deputy Director of Agriculture, Northern Circle, and to the Superintendent of Agriculture Rajshahi Division, for their satisfactory organization of the distribution, and thanks are also due to Messrs. Ralli Brothers for considerable trouble taken by them in supplying the right kind of seed.

Ufra Disease of rice.

The work with regard to *Ufra* was confined during the year to propaganda *i.e.* the advocation of stubble burning and subsequent ploughing of the land For this purpose 6 demonstrators were employed in the various tracts affected.

There is little doubt that *ufra* can be eliminated from an affected tract, if the latter could be drained at a sufficiently early date to allow of thorough burning of stubble and subsequent cultivation of the land. An investigation is now in progress to see how far it will be possible to drain certain *bhils* in the Faridpur district, which are particularly badly affected by *ufra*. The Irrigation Department has undertaken the necessary survey.

The Cyclone.

An official account of the great cyclone of 1919 has already been issued and it is only necessary here to refer to the measures taken by the Agricultural Department. The storm crossed the coast of Khulna from the Bay of Bengal in the morning of the 24th September 1919, and passed out of the Mymensingh district about 24 hours later. The districts affected were Khulna, Faridpur, North-West Bakarganj, Dacca and South-East Mymensingh. Of this area the most damage took place in the Faridpur and Dacca Districts.

All Agricultural officers were immediately recalled from leave and ordered to present preliminary reports regarding the damage done by the storm to

(*a*) Stored grains.

(*b*) Standing crops.

(*c*) Fruit trees.

(*d*) Cattle.

Some delay was caused by the almost complete disorganization of post and telegraph services, and messages had to be carried though by hand.

In all cases, a large proportion of stored grain was reported damaged or lost and this included *rabi* seeds and pulse food. Prices were rising; moreover, the sowing season had already begun. It was therefore decided, after consultation with the Commissioner of Dacca, and with the approval of Government, to immediately import *rabi* seeds in such quantity as to keep prices in the affected area down to a reasonable level; as well as to supply people in need of seed, either by loan or by sale, as they might choose. It was obviously necessary to import seed from outside, as to obtain it inside the affected area, would have defeated the objects in view. For this reason about 27,000 maunds (950 tons) of seed of different kinds were obtained, through Messrs. Ralli Brothers of Calcutta, and brought in two flats to Madaripur Lohajong and Narayanganj as main centres of distribution.

Pending the arrival of the seed, arrangements were made at 42 sub-centres in the Faridpur, Bakarganj and Dacca Districts, and agricultural officers, including a number drafted from unaffected tracts in Western and Northern Bengal were posted at each.

The work of taking the seed from the main centres to the sub-centres and, later on, its distribution on loan, or sale, involved much work of a hard and unpleasant nature; but it is satisfactory to note that, almost without exception, the work was well done, and I am glad to record my appreciation of the efforts of all the officers who took part in it.

The germination capacity of all seeds was tested and found satisfactory before distribution.

The prices at which the seed was offered included the cost of freightage and these were, and remained, above or below local prices according as there was a large demand for them or not.

In consultation with the Honorable Member it was at first decided that loans should be given on individual security to persons certified by Panchayats. Subsequently however a certain number of joint loan bond were issued.

There was a very great demand for *khesari* (*Lathyrus sativus*) and for green peas (*Pisum arvense*) throughout the area, and stocks were quickly disposed of. The same applies to lentils (*Lens esculenta*), another 500 maunds of which could have been disposed of in the Faridpur district if it had been available.

The demand at many of the centres continued, and even increased, as the sowing season advanced. This is partly attributed to the comparatively gradual spread of news of the existence of the seed stores; but it was also partly due to cultivators having first bought bad bazar seed and being

compelled, later on, to resow. There was comparatively little demand for mustard and for *mati kalai* (*Phaseolus mungo*). This is probably partly due to the official figures for the area under mustard being over-estimated, a little mustard often being sown mixed with *khesari*; but another probable reason is also that the people were bent on cultivating food crops, as opposed to revenue crops.

Mati kalai and *mung* (*Phaseolus radiatus*) are the earliest sown of the rabi crops and the small demand for these seeds was due to their sowing season being far advanced before the imported seed was available.

Altogether a total of 11,500 maunds (425 tons) of seed was loaned to cultivators and a further 3,600 maunds (170 tons) was sold in the area. The balance was ultimately returned to Calcutta, and sold by the Director of Civil Supplies at prices which, except in the case of mustard, were substantially the same as those at which the seed had been purchased.

The operations were an undoubted success, for many thousands of cultivators, who had not the ready money to buy seed, were enabled to obtain what they required on loan. Moreover the bringing of large stocks of seed into the district certainly prevented prices from rising very high, and thus enabled cultivators who had money, to purchase their requirements at a reasonable price.

It is necessary to mention that accommodation for the seed at sub-central was, in many cases, provided by local gentlemen, to whom the Department is much indebted.

Bengal Agricultural Department Board of Agriculture.

This Board was established by Government on the suggestion of the Government of India, and it consists of the Director of Agriculture, the Superintendent of the Civil Veterinary Department and the Expert Officers of both Departments. Meetings of the Board may take place at any time; but one public meeting is to be held each year, to which representative people, official and non-official, who are interested in Agriculture are invited.

The first public meeting of the Board took place in Calcutta on 18th March 1920, and was opened by His Excellency the Governor. After His Excellency's speech, a number of resolutions, embracing the chief agricultural problems of the Province, were discussed under the presidency of the Hon'ble Mr. J. G. Cumming. The meeting was a great success and future meetings will be looked forward to by officers of the Agriculture Department as affording an opportunity to meet un-official gentlemen who are interested in Agriculture; to learn their views on the many important agricultural questions of the day, and to enlist their aid in the solution of these problems.

General.

The progress detailed in the last report has developed during the year under review. The organization of the Department and its work is still in progress: up to the present the demonstrators have been temporary servants of Government on a fixed pay; but a demonstrator's cadre has now been created with an incremental scale of pay. These improved prospects will doubtless add considerably to the efficiency of the work of the demonstrator, and the great competition for vacancies now enables really good men to be selected for training.

The policy of Government, in regard to the erection and maintenance of seed stores, has been laid down, and rules defining the respective shares to be taken by the Agricultural Department, and by officers in charge of Government estates, have also been outlined

During the year, experimental and demonstration work has commenced at the Mymensingh, Bogra, Comilla and Gosaba farms, and the present year will see other farms at Suri, Bankura, Berhampur, Faridpur, Bakarganj, Jalpaiguri and the Chittagong Hill Tracts, either completed, or carried to an advanced stage The Vernacular Agricultural School at Dacca, was opened in January last, and the one at Chinsurah will be ready very shortly. In addition Babu Manmatha Pal has given Rs 20,000 and 12 bighas of land for the establishment of agricultural classes and field demonstrations at the Middle English School at Amarpur, Burdwan District. A similar offer has been made by Babu Chuni Lal Bag at Mahisadal, Midnapore District.

On the research side the cattle investigations at Rangpur are making progress. At Dacca and elsewhere, work is proceeding with the object of introducing still better strains of crops than have at present been obtained. and of improving agricultural practice generally. This work now included the investigation of fodder crops, for it is realized that Rangpur can do little, if any, permanent good in improving the cattle over large tracts in Bengal, unless corresponding progress in animal husbandry is made by the cultivator.

Much work still remains to be done, and research and further application of the practical results already obtained are needed. The improved races of rice and jute are already grown over large areas ; but these are only a fraction of the respective totals. The introduction of new crops like groundnut, and the popularization of the use of suitable manures offer almost unlimited scope for propaganda and for co-operative credit.

If more evidence than that already given were required to shew that the public now realize that the Agricultural Department can, and is, doing great good to the country, the action of District Boards, in offering land and public money for the establishment of farms, and the increase in vitality as well as in the number, of Agricultural Associations, would supply it in plenty. It would appear that the machinery is at hand, for putting into practice on a very wide scale, the improvements which the Agricultural Department recommends. The only way however in which all this potentially useful energy can be properly controlled and made the most of is by a further considerable increase in the number of agricultural officers and demonstrators, and it is to be hoped that sufficient money will soon be available for this purpose.

SECTION II—SERICULTURE.

General.—The work was continued on the lines of previous years under the control of the Director of Agriculture, assisted by the Bengal Silk Committee as an advisory body. The Committee held 3 meetings during the year.

Rai Saheb A. C. Ghosh remained in charge of seed production, with headquarters at Berhampore, while Mr. P. C. Chowdhury continued in charge of the cross breeding experiment, also at Berhampore. Miss Cleghorn carried on her work at Alipore as usual.

The work of seed production has again expanded by about 35 per cent and the total sales amounted to 21,000 *kahons* (one *kahon*=1280 cocoons) worth Rs. 84,000, as against Rs. 62,000 in the previous year, and Rs. 33,000 in 1917-18. It is worth noting that the total budget of the silk department was only Rs. 1,23,000.

In the year under review the seed cocoons supplied by the Department are estimated to represent about 28 per cent. of the total seed used, and they were sold at rates approximating to double those prevailing for ordinary cocoons. There, are however, indications that the present staff has reached its limit of production, and a new nursery at Bholahat near Malda has been provided for. A further possibility of expansion lies in the utilization of selected rearers, whose seed cocoons have, so long as proper supervision over them can be retained, been quite satisfactory.

The area under mulberry is believed to have further increased, by about 1,000 acres, in the past year to a total of about 25,000 acres, and the good prices which have been obtained for silk are said to have induced people to take up the industry who have not hitherto been in the habit of rearing silk.

Two or three years ago small nurseries were established in the hills at Darjeeling, Kurseong and Kalimpong. It has been found that the rearing of a generation of either *nistari*, or *chhotapoloo*, in the cooler climate of the hills invigorates succeeding generations, up to the third, with a distinct increase in productive power as a result.

Ten boys passed from the Rajshahi Sericultural School during the year and five from the Berhampore school. Each pupil, who passes the final examination at a Sericultural School, receives a reward of Rs. 250, with which he has to build a model rearing house, in which to carry on the improved methods which he has learned at the school. It has been pointed out that many pupils do not carry out this undertaking, and it has been proposed to appoint an officer to keep in touch with ex-pupils, and to see that they continue to practice improved methods. If this can be ensured in only a reasonable percentage of cases, the Sericultural schools will do very valuable work; for each pupil would become a demonstration nucleus, and possibly also a rearer of selected seed cocoons. They would thus not only benefit themselves pecuniarily by the increased prices at which their cocoons would sell, but would also help the industry at large by increasing the supply of such cocoons.

Cross breeding Experiments.—Three hybrids, two of which were produced by the late M Grangeon, and the third by Miss Cleghorn, are under trial by the Superintendent of Sericultural Research, on a field scale. Grangeon Nos. 1 and IV have also been distributed in two villages for comparison with the local *nistari*: it is, too early yet to say if the margin of improvement noticed will remain permanent under the ordinary conditions of rearing.

Other Scientific work.—Miss Cleghorn's work on hybridization continues. Apart from the production of hybrid races, observations are being made in regard to the habits of the silk worm, and the effect of the environment on the capacity of the worm for production of silk. These observations tend to confirm the evidence already available regarding the effect of taking seed cocoons to the hills.

Miss Cleghorn is also working on the classification of the varieties of mulberry.

SECTION III—MISCELLANEOUS.

Statistical.—All crop forecasts and other statistical returns were published as usual. A quinquennial report on the schedule of normal rates of prices of cheapest rice was issued during the year. A detailed census of agricultural stock was taken for the Province in January 1920.

Rainfall.—During the year under report two rain recording stations were opened and one closed, making a total of 243 in the Presidency.

Financial.—The receipts and expenditure of the Department for the year 1919-20 as furnished by the Accountant General, Bengal, are detailed below :—

Receipts.

	Rs.	A.	P.
Receipts from Sericultural Nursery	81,583	12	0
Sale of manures and Farm produce	41,004	8	2
Other receipts ...	12,321	8	9
Miscellaneous ..	499	9	6
Total ...	135,409	6	5

Expenditure.

	Rs.	A.	P.
Superintendence ...	91,340	3	10
Expert Staff ...	322,032	1	2
Experimental Farms ...	208,206	11	11
Agricultural Experiments	22,859	14	0
Seed Stores	11,506	10	3
Public Exhibitions and Fairs	2,541	5	11
Sericulture ...	180,184	11	5
Total ...	838,671	10	6

Acknowledgments.—The Department is grateful to the large and increasing number of Government officer and private individuals who have rendered help with work in the districts during the year. The Calcutta jute firms have continued, at their own expense, to carry out experiments at their mufassil agencies and also to sell departmental seed to neighbouring cultivators. The thanks of the Department are specially due to those who rendered help in the cyclone relief operations. In spite of many other duties, Mr. Lambourn, I.C.S Collector of Dacca, Mr. Roy, Collector of Faridpur and Mr. Staig, I.C.S., Sub-Divisional Officer of Narayanganj, went to great trouble in helping to make the work a success. Great credit is also due to Mr. Godden, Joint Agent, River Steamer Companies, of Narayanganj, who rendered most valuable assistance throughout, in providing godown accommodation, and in handling the very large amounts of seed, not only on its arrival from Calcutta, but also in the course of its distribution to the numerous sub-centres.

The late Hon'ble Rai Sitanath Roy Bahadur, Rai Janaki Nath Roy Bahadur, Babu Jagadish Chandra Banerji of Murapara, and Babu Rajendra Chandra Sircar provided accommodation for the seed at Kadirpur, Lohajong, Murapara and Madaripur respectively. Mr. Sturrock of Messrs Bird & Co., Madaripur, Mr. De Monte, and many others too numerous to mention, all gave great help which the Department is glad to acknowledge.

Staff.—The continued absence of three of the superior staff has entailed heavy work on the part of Messrs. Hector, McLean and Rai Rajeswar Das Gupta Bahadur. Special credit is due to Mr. McLean for his untiring efforts in connection with the cyclone relief work; also to Rai Rajeswar Das Gupta for superintending the procuring and despatching of the seed from Calcutta. During the year the latter officer has been admitted into the Imperial Agricultural Service and has also received the honour of a Rai Bahadurship. Mr. J. N. Sircar, Superintendent of Agriculture in the Burdwan Division; Babu Jamini Kumar Biswas, Superintendent of Agriculture in the Dacca Division and Babu B. Dutta, Superintendent of Agriculture in the Rajshahi Division all deserve mention. Babus, N. C. Basu, Tara Nath Roy, Gosthabehari Pal, and Indu Bhusan Chatterjee did good work in the cyclone relief operations. Rai Sahib Mr. A. C. Ghosh, Superintendent of Sericulture has again materially increased the outturn of selected seed silk cocoons, and deserved the honour which has been conferred on him.

I am glad to record the good work done by my Personal Assistant Babu Jyotis Chandra Roy.

APPENDIX I.

Report of the Deputy Director of Agriculture, Western Circle, Bengal, for the year 1919-20.

The Western Circle is comprised of the 11 districts included in the Presidency and Burdwan Divisions and covers an area of 31, 420 sq. miles.

I was in charge of this Circle all through the year under report and during the time was assisted by Messrs Sirkar, Mitra and Gupta as Divisional Superintendents and a number of District Agricultural Officers and Demonstrators. I was out on tour for 172 days, Mr. Sirkar for 234, and Mr. Mitra and Mr. Gupta 203 days. The district officers were constantly on the move.

Besides one District Agricultural Officer for each of the districts, additional Agricultural Officers were entertained at Bishnupur, Rampurhat, Bolpur and for the last part of the year at Meherpur. In the Burdwan Division, there were 27 Demonstrators entertained by the Government and 12 by District Boards or Wards Estates the corresponding numbers in the Presidency Division being 14 and 2 respectively.

Character of the Season.—The season on the whole was favourable but the absence of rainfall from September to January did some damage to the paddy crop on higher lands.

Demonstrations:—As usual in previous years the items of demonstration were as follows:—

1. Bonemeal on winter paddy in the Laterite areas.
2. Distribution of Departmental seeds, *e. g.*, Indrasail, Kataktara, and Nagra and R. 26 Jute.
3. Introduction of new crops *e. g.*, Groundnut etc.
4. Green Manures.
5. Introduction of the better varieties of existing crops *e. g.*, Sugarcane, Cotton, Arahar etc.
6. Implements.
7. Conservation of Cowdung; use of oilcakes as manures and trial of other articles.

1. Bonemeal has been very successful in the Districts of Birbhum, Bankura and the higher tracts of Midnapore and Burdwan. There was a large demand for this manure but not more than 106 tons could be supplied.

2. *Jute R. 26*:—In the Burdwan Division this seed was distributed in ¼ lb. packets to nearly 6,000 cultivators. In the Presidency Division the quantity distributed was 8,250 packets and everywhere it has been impressive. Though meant exclusively for propagation, isolated plots were cut for fibre just to show its superiority, and the Jute was found to be a better yielder, showing a difference of 2½ mds. of fibre per acre over the local varieties.

Indrasail:—In the Burdwan Division the result was satisfactory on low lands where there was moisture in the months of October and November. The absence of rainfall however, in September and October affected the culture in many places. In the Presidency Division, Kandi Sub-Division is perhaps the best tract for this paddy, trials there having given an increase of about 1 md. per bigha, on an average, in its favour. It has also been tried with success in other places where good moisture conditions persist until late in the year.

Nagra:—In the Hooghly District this is the most important variety of Aman Paddy On fairly low lands it has given good results, and as it has the advantage of flowering abou

14 days earlier than Indrasail, it has a correspondingly wider application than the latter. The maximum outturn reached 50 mds. per acre in the Burdwan Division.

Kataktara :—In the Burdwan Division, where it was transplanted it has given uniformly good results and in the Presidency Division also it has done well as a broadcasted *Aus*. During the year under review about 100 mds. of the seed were distributed in the Burdwan Division and 26 mds. in the Presidency.

3. Of new crops tried, Groundnut may be mentioned. It has been introduced with great success in the Burdwan Division. Though the season was not favourable to this crop, the high prices ruling compensated for the low outturn. The area is increasing in many places. In the Burdwan Division the maximum outturn reached so much as 35 mds. per acre and even on poor soils an outturn of 18 maunds per acre could be obtained. The process of extracting oil with the help of a simple wooden machine was demonstrated. In the Presidency Division the crop was tried in Nadia and Murshidabad not only for the seed but as a forage crop and there appears to be a good future for groundnut in those depopulated tracts where nothing but grazing pays. The outturn in Nadia and Murshidabad ranged between 4 to 6 mds. per bigha.

4. *Dhaincha as Green Manure* :—On the alluvium, *Dhaincha* as a green manure has given very good results. In the Burdwan Division where 325 mds. of seed were supplied, an increase of 3 to 6 mds. of grain per acre has been attributed to its use. In the Presidency Division also this is being tried with success and 25 mds. of seed were distributed.

Green manuring with Cowpea is becoming popular wherever demonstrated.

5. *Sugarcane* :—In the Burdwan Division one lakh of cuttings of improved canes were distributed among cultivators, each being given 250 setts. The demand for *Mauritius* and *Barbadoes* cuttings is so heavy that it is impossible to meet them from our Farms. In the Presidency Division the number of setts given to an individual cultivator was 200 and the total quantity distributed was 26,500 cuttings. In this Division there is a great demand for *Yellow Tanna*.

Arhar (*cajanus indicus*):—4 mds. of Comilla seed were distributed in the Districts of Nadia and Murshidabad. Good crops were obtained, the outturn averaging to 8½ mds. per acre against 6 mds. of the local.

Pusa (No. 4) wheat (20 maunds in the Burdwan and 1 maund in the Presidency Division) was distributed and tried against the local varieties. It has been found to be the most suitable type for those wheat growing districts where there is short moisture. Orders are being registered and the supply is expected to reach 100 maunds next season.

Potatoes :—Potato seeds were not supplied departmentally, but every endeavour was made to put intending buyers in touch with reliable seed dealers.

Cotton :—Dharwar (American) seeds were distributed among cultivators free of cost (750 maunds in the Burdwan and 50 maunds in the Presidency Division) very late and the results were neither uniform nor encouraging.

6. Demonstration of implements was a regular feature of the year's work. The improved ploughs, hand and bullock hoes, Dones and Pumps were demonstrated.

7. In the Presidency Division conservation of Cowdung in covered pits was shown in many places. In both the divisions castor cake was tried on potatoes, sugarcane and paddy with great success.

Agricultural Associations :—The Establishment of Branch Agricultural Associations. has taken a regular shape in the Burdwan Division, specially in the District of Birbhum Nearly 200 Associations are in working order in the Division. In the Presidency Division, there is a District Association in every District, and 59 Branch Associations. These are

active organisations, carrying out not only demonstrations, on their own account, but also propaganda work on our behalf.

Seed Stores:—In the Burdwan Division the Howrah Seed Store was under the Superintendent and there was a District Seed Store in every district. In the Presidency Division the Divisional Store was abolished and district stores have been started in all the district Headquarters. The District, Sub-District and the Branch Agricultural Associations in Birbhum, the District Agricultural Association of Bankura, the Branch Agricultural Associations at Kalna in Burdwan, and at Jhargram, Tamluk, Ghatal and Contai in Midnapore, arranged to have temporary stores at the time of distribution of seeds and manures during the seasons. There were four temporary relief stores at Mollahat, Bagerhat Fakirhat and Barabaria, supplying *Rabi* Seeds in the Cyclone affected areas of Khulna. The main principle governing the stores was that only seeds &c., recommended by the Department should be supplied on a cash basis to parties indenting for them.

Agricultural Education:—The construction of buildings for the proposed Agricultural Middle Vernacular School at the Chinsurah Farm is expected to be finished shortly. This is for training boys from 14 to 18 years old, who are the sons of cultivators, in agricultural improvements as recommended by the Department. Through the generosity of Babu Manmatha Nath Pal an Agricultural class with a demonstration Farm attached to it has been opened in the Amarpur Middle English School in the District of Burdwan. An offer of a similar nature has come from Mohisadal in the Midnapore district. The Methodist Episcopal Church at Asansol has also opened a demonstration Farm with their school for practical training in Agriculture.

The Chillian Nitrate Company has helped in the opening of 16 night classes in Birbhum and 1 in Bankura.

Farms:—There are no agricultural Farms in the Presidency Division though the need for one is very pressing as the area is a distinct unit in itself where the results of other stations cannot be introduced or recommended with confidence. A proposal for opening two Farms, one at Berhampore and the other at Khulna is under consideration. The District Board at Khulna has promised to pay Rs. 10,000 for the establishment of a Farm there. The proposed Farm at Suri will also be opened next year. There have been opened several private Farms, and our officers are always glad to help these private enterprises. There is no doubt that the amount of public interest taken in Agriculture is increasing.

Chinsurah Farm:—Under the guidance of the Expert Officers a considerable amount of research work in connection with jute, paddy and sugarcane is in progress at this Farm. A considerable sum was spent on improvements in the past year.

Burdwan Farm:—The Eden Canal instead of being an advantage, has been a source of some trouble as there is no other outlet for the water to pass away in the rainy season. Rs. 2,500 was spent in the past year on improvements.

Exhibitions:—Several Exhibitions were held all over the Circle of which the most important were the Calcutta Peace Celebration Exhibition and the Suri Mela, opened by His Excellency, the Alipore Flower and Agricultural Show, the Banjetia Exhibition, the Burdwan Exhibition and the Serampore and the Panchthubi Melas. In all these places interesting collections of departmental Exhibits were sent and many Engineering Firms *e.g.* Messrs. Leslie, T. E. Thomson & Co also co-operated with us. Where possible, attempts were made at these exhibitions, to introduce practical field demonstration with improved seeds and manures.

Court of wards' Estates and Khasmahals:—In the Presidency Division successful demonstration of departmental recommendation was carried on in the Janbazar and Gobardanga Wards' Estates.

In the Burdwan Division, introduction of new crops and other demonstrations were undertaken in the Nayabashan Wards' Estate in Midnapore and in the Sarat Kumari Estate in Bankura

There are many Khas Mahals in the Midnapore District but very little was done by them in the way of Agricultural improvement.

Merits of Officers and acknowledgments :—I am much indebted to the Divisional Superintendents for their loyal co-operation and assistance. The District Agricultural Officers also worked hard and some of them had to work under trying circumstances in connection with the cyclone Relief Work.

Our thanks are also due to the administrative officers all over the divisions for valuable suggestions and for assistance most ungrudgingly given. In this connection, the names of Mr. J. N. Gupta, Commissioner, Burdwan Division, Mr. G. S. Dutta, Collector of Birbhum. Mr. J. Vas, Collector of Bankura, Mr. A. W. Cook, Collector of Midnapore and Mr. L. Birley, late Collector of Burdwan may be specially mentioned. I am also specially indebted to Mr, Thorpe, the late Collector of Khulna for his sympathetic help.

Thanks are also due to the Sub-Divisional Officers, Chairmen of District Boards, Managers of Court of wards' Estate and to the many private gentlemen who have taken a lively interest in the Departmental work.

RAJESWAR DAS GUPTA.
Deputy Director of Agriculture.

APPENDIX II.

Report of the Deputy Director of Agriculture, Eastern Circle, for the year 1919-1920.

The year ending on 31st March 1920 was one full of difficulties for the cultivator. The long period of drought in the cold weather of 1918-19 was not broken until well on into April 1919, with the result that sowings of *Kharif* crops were late. Throughout the season the danger of drought was ever present, to be diminished by falls of rain when the situation was becoming critical.

The shortage of rainfall was particularly felt in the Mymensingh District where the scarcity of water for retting jute seriously affected the quality of what would otherwise have been a fine crop.

Both the *aus* and *aman* crops of rice were above average and the year should have been a fruitful one for cultivators.

In the Districts of Faridpur, Dacca and parts of Barisal and Mymensingh the great cyclone of September 1919 reduced the population to a state of great distress, which the good crops in great part helped to ameliorate. During the period following the cyclone, the whole energies of the officers in the circle were concentrated on relief measures in distributing *rabi* seed in the distressed areas. This work has already been reported upon.

Besides the disturbance caused by the transfer of officers from their duties for a period of something like 3 months the cyclone affected the Department seriously in other ways.

In the first place the Dacca Farm was a wreck and work came to a stand still whilst the wreckage was being cleared.

The stocks of *Kataktara* paddy seed, already reduced by bad conditions at harvest time were further damaged owing to their becoming wet.

The sugarcane crop was completely spoilt so that no distribution of cuttings was possible.

It was fortunate that Mr. D. Dutta had completed a detailed record of experimental work on the farm as most of the records in the farm office were blown away with the building.

In the Districts automatic expansion of paddies practically ceased. The scarcity of food grains prior to the cyclone was intensified after the storm and large quantities of *Indrasail* and *Kataktara* paddy seed which would otherwise have been available for sale to or exchange with other growers was consumed as food.

Staff.

During the year two Additional District Agricultural Officers were entertained in what are eventually to be the Jamalpur and Narayanganj Districts. Babu Benode Chandra Ghose was transferred from the Burirhat Farm to take charge at Jamalpur and Babu Promatha Chandra Chakraburty from the Arboricultural Section, Dacca, was given charge at Narayanganj.

Babu Benode Chandra Ghose was subsequently posted to Chittagong as District Agricultural Officer and Babu Prafulla Chandra Das transferred from Chittagong to Jamalpur.

The newly created post of Assistant Farm Superintendent, Dacca Farm, was given to Munshi Abdul Jalil who has been serving in the Department for many years.

I regret to record the death of Babu Jogendra Nath Dutta, Senior Overseer on the Dacca Farm who had served industriously for a number of years.

During the year I visited all the Districts in the circle including the Chittagong Hill Tracts. I spent 127 days on tour.

Farms.

As already indicated the work on the Dacca Farm received a serious set back by the Cyclone.

Wet weather at Harvest spoilt the bulk of the *Kataktara* paddy for seed purposes.

The *Indrasail* paddy crop was excellent and the seed is being sent to the Districts to replace mixed seed returned by cultivators.

The buildings on the Comilla and Mymensingh Farms were completed and the farms laid out ready for cropping.

The Backerganj Farm was unfortunately not started owing to delay in acquiring the land.

District Work.

In my last years report I stated that it was expected that there would be 75,000 acres under *Indrasail* paddy in the circle and 1,00,000 acres under K. B. jute.

During the year the areas have been carefully checked and the area under *Indrasail* paddy found to be 60,000 acres and that under K. B. jute 1,35,000 acres. As already mentioned the automatic expansion of *Indrasail* paddy has had a set back owing to the high price prevailing for rice.

The introduction of *Kataktara* paddy has been slow owing to short stocks of seed. The demand has been very great and we have been quite unable to cope with it

High prices have been responsible for the tardy advance in the taking up of manures an implements. The price of bonemeal has advanced from Rs. 3 per maund to Rs. 7/8 per maun and Springtined Harrows from Rs. 30 to Rs. 65.

The value of Water Hyacinth as a manure is being realized and the dried plant is carried to considerable distance for application to the Fields.

Agricultural Associations

Associations on the lines advocated by Mr. Milligan were organized in those centres where Demonstrators were placed. In the Faridpur District extra men were posted so that the value of these associations might be fairly tested.

The associations have on the whole been very successful, the members taking an active interest and endevouring to improve the conditions within their circle. A number of Associations however after the initial burst of enthusiasim have become moribund and have made no attempt to further the object of their existence. The chief object of the members of such societies seems to be to obtain supplies of seed for nothing.

Conference, Exhibitions &c.

The annual Panchayati Conference was held on the Dacca Farm and a successful day was spent. His Excellency the Governor addressed the Conference.

Exhibitions were held at Barisal, Chittagong, Kalkini, Mymensingh and Dacca and the Department assisted with exhibits and prize money. Shortage of funds however prevented any considerable exibits being made.

Dacca Farm Vernacular School.

The school was opened for work on the 15th January. Mr. Biswas a graduate from Tokyo, Imperial University, Japan, was appointed Head Master and Babu Himangshu Bimal Mukherjee trained at the Dacca Engineering School and Moulvi Iyakub Ali trained at the Chittagong Normal School were appointed as Assistant Masters.

15 Hindu and 15 Moslem boys were selected for admission. Of these four found the work too hard for them and left the school and were replaced by other applicants. One boy was found unable to follow the class work and was also replaced.

The majority of the boys are keen and industrious and the school should turn out a fine class of lad.

Agricultural Institute.

The preparation of plans, estimates and details for the Agricultural Institute entailed a considerable amount of work. Mr. Kerr, Executive Engineer kindly expedited the preparation of plans and estimates. I have to thank him also for his assistance in the construction of the buildings for the Vernacular School, his expert advice being very valuable indeed.

300 acres of land have been acquired adjacent to and North of the Dacca Farm for the Institute and it is hoped that construction work will soon commence.

Acknowledgments.

In conclusion I have to thank the staff under me for continuous good work during a trying year. Particular mention may be made of Superintendents of Agriculture Babus Jamini Kumar Biswas, Kalidas Roy and Mr. D. Dutt, District Agricultural Officer Debendra Nath Mitra and Surendra Nath Sen also my head clerk Babu Nalini Mohan Sen who had to bear the burnt of the heavy clerical work subsequent to the cyclone.

I have to thank Rev. Mr. Barber of the Mission School, Faridpur for his valuable advice on matters pertaining to the Agricultural School. Acknowledgments are also due to Representatives of Jute Firms for their willing co-operation in jute experiments.

Mr. Roy, O. B. E. Collector of Faridpur has not only encouraged agricultural improvement in his own District but has made many valuable suggestions of a more general nature.

Mr. Blackwood, Collector of Backarganj has been enthusiastic in introducing improved methods in that District and has assisted us by appointing men on Khas Mahal estates to bring these improved methods to the notice of the cultivator.

K. McLEAN.
Deputy Director of Agriculture, Eastern Circle.

APPENDIX III.

Report of the Deputy Director of Agriculture Northern Circle, for the year 1919-20.

Introduction.—This Circle consists of the eight districts of the Rajshahi Division with a total area of 19,235 square miles or 12,310,400 acres. The Northern portion of this area consists of the Himalayan ranges with the strip of submontane country in Jalpaiguri, running along the foot of the Himalaya. The remainder of the circle forms part of the Gangetic plain. The surface consists of recent alluvium except in portions of Malda, Rajshahi, Dinajpur and Bogra which belong to an older and more elevated alluvial formation known as "Barind."

Character of the season.—Generally speaking the season was favourable both for *Bhadoi* and *Rabi*. In the district of Rangpur, however, scarcity of water was felt at the time of jute steeping and for transplanting paddy after jute—a practice more or less common all over the Division, specially in Jalpaiguri, Rangpur and Dinajpur.

Charge and Tours.—I was in charge of both Northern and Western Circles with headquarters at Calcutta throughout the year. I spent altogether 67 days on tour in this circle. Mr. J. N. Chakraburty B.A., M.S.A., Superintendent of Agriculture, held charge of the Division till the 13th May 1919 when, on his transfer to Assam, Babu B. Dutta relieved him.

The number of days spent on tour and the places visited by the 2 Superintendents are shown below:—

Name of Officers.	No. of days spent on tour.	Names of places visited.
Mr. J. N. Chakraburty ...	30	Pabna, Bogra, Dacca, Naogoan.
Mr. B. T. Dutta ...	206	Burirhat, Bogra, Siliguri, Jalpaiguri, Pabna Naogoan, Malda, Natore, Calcutta, Paikor, Rajshahi, Santahar, Haldibari, Dinajpur, Saidpore, Dacca, Gaibandha, Nilphamar. Parbatipur, Madarihat, Alipur Duar, Lalmonirhat, Chinsurah, Sirajganj, Jaypurhat Burdwan, Jhalmalia and Moynaguri.

Establishment.—During the year there was an Agricultural Officer in charge of every district. In Rajshahi however the district work was divided between the District Agricultural Officer and Farm Superintendent—the former being in charge of the Sadar and the latter of the other two sub-divisions of Natore and Naogoan. Besides the Agricultural Officers, the subordinate staff consisted of 17 Demonstrators, and 11 men were entertained by the Khas Mahal estates, Agricultural Associations and Court of Wards. The District Agricultural Officers were constantly on the move. On account of a considerable development of work all round, the employment of additional Agricultural Officers and Demonstrators has become imperative.

The following are the items of work done in the Division.

1. Distribution of improved seeds raised by the Experts.
2. Introduction of new crops.
3. Introduction of better manure.
4. Introduction of useful implements.
5. Extension of the area of cultivation under *Rabi* crops by seed distribution.

1. *Distribution of improved seeds raised by the Experts.*—*Indrasail* paddy and *Kakya Bombai* jute seeds were distributed to cultivators in all the districts, the former on

condition of return of an equal quantity of the harvest and the latter for seed propagation. The results have been generally successful and a greater demand for these seeds is expected The details of distribution will be found in the following table.

KAKYA BOMBAI JUTE.

District.	Quantity in lbs.	No. of people.	No. of maunds.	No. of Unions.
Dinajpur	1,986	7,944	13	38
Rajshahi	8,342	33,368	9	28
Bogra	2,508	10,032	6	...
Rangpur	6,910	27,640	5	42
Pabna	5,692	22,768	10	24
Darjeeling	220	880	1	4
Jalpaiguri	1,774	7,096	7	22
Malda	1,552½	6,210	8	30
	28,984½	108,938	...	...

INDRASAIL PADDY.

District.	Quantity distributed.	No. of people.	No. of maunds.	No. of Unions.
Dinajpur	15,320	1,532	13	29
Rajshahi	63,464	6,347	14	47
Rangpur	40,940	4,094	12	50
Bogra	45,150	4,515	4	17
Pabna	9,480	948	6	14
Darjeeling	760	76	1	1
Jalpaiguri	15,200	1,520	7	20
Malda	6,460	646	8	20
	196,774	19,678	...	...

In addition to the above 1,720 lbs. of *Indrasail* paddy and 5,739½ lbs. of *Kakya Bombai* jute seeds were sold in different districts at cost price.

Kataktara Aus Paddy.—Kataktara Aus Paddy was tried in 6 districts as shown in the table below :—

District.	Quantity in maunds.
Dinajpur	19
Rajshahi	215
Rangpur	78½
Bogra	18
Jalpaiguri	19½
Malda	19

The seed was sold everywhere at cost price (about 2/8 to Rs. 3). Dinajpur is the only district where it did well, giving an average outturn of 23 maunds per acre. The demand for *Kataktara* was greater than the quantity of seed available for sale.

About 128 maunds (4½ tons) of R. 23 jute was distributed on cash basis in the *Olitorius* tracts.

2. *Demonstrations.*—Demonstrations, on a small scale for the purpose of introduction, were undertaken with the following crops :—

(*i*) Superior varieties of sugarcane.
(*ii*) Sumatra tobacco.
(*iii*) Wheat (*Gangajali* and *Pusa*).
(*iv*) Cotton.

(*i*) *Sugarcane.*—Yellow *Tana* proved its superiority over all other canes for its hardness, thickness and bigger outturn. There was a demand for 243,400 setts out of which we could meet only 97,431 from our Farms. In Rangpur district the softer canes, such as B. 147 and *Gandari*, are also much liked.

(*ii*) *Sumatra tobacco.*—Sumatra tobacco has proved a great success at Rangpur and its area is increasing year after year. In 1918-1919 the area was only 20 acres ; but in the year under report there were about 100 acres. A special officer was entertained for 6 months to look after the fermentation of the leaves of those cultivators who do not know the process. Arrangements were also made to assist cultivators in selling their produce and a co-operative sale society is now being started with the help of the Co-operative Department with this object in view.

The Rangpur District Agricultural Associations helped the cultivators in putting up curing sheds and in arranging to bring to Rangpur some of the mufussil grown tobacco for fermentation and final disposal.

(*iii*) *Wheat.*—About 40 maunds of *Pusa* Wheat and 465 of *Gangajali* wheat were distributed at cost price. *Pusa* wheat has proved a great success in the Malda district. In Rangpur *Gangajali* gave better outturn.

(*iv*) *Groundnut.*—Groundnut cultivation was tried in the light soils of Dinajpore, Bogra, Malda and Pabna. In Bogra, where this is the second year of cultivation, an average outturn of 6 maunds per bigha has been obtained.

(*v*) *Cotton.*—258 maunds of Dharwar American cotton seeds were distributed. Owing to late arrival of the seed the results of trials were not definite ; but in general they were not encouraging.

3. *Manures.*—The beneficial effect of castor cake on sugarcane and potato, *Dhaincha* green manuring on Aman paddy, cowpea green manuring on tobacco, bonemeal on *Aman* paddy was demonstrated with good results. Cowpea green manuring on tobacco is making a good headway in the Rangpur district.

Implements.—Demonstrations on the use of Meston plough, Rajeswar ploughs, Planet Junior Hand Hoe, Sugarcane Crushing mills were made ; as a result of this a few of the above implements were supplied at a cost price.

Rabi seeds.—The idea of distributing *Rabi* seeds originated in Resolution No. 1 of the Provincial Agricultural Association at their meeting held on July 4, 1918. The suggestion embodied in the above resolution was given practical effect to by supplying seeds to the cultivators at cost price at sowing time. About 1,989 maunds of *Rabi* seeds were dealt with.

Farms.—In the Northern Circle at present there are 5 farms—3 at Rangpur, 1 at Rajshahi and 1 at Bogra. The Bogra Farm is just started.

Land has been acquired for another Farm at Pabna, and the construction of the buildings will be taken up shortly.

Khas Mahals—There are 6 Khasmahals, 4 in Jalpaiguri, 1 in Bogra and the other at Malda in this Circle, where demonstrations on *Kakya Bombai* jute, *Indrasail* paddy, Darjeeling potato and *Rabi* Crops are being made under our supervision.

The Jalpaiguri Khasmahals maintained 4 seed stores and a demonstrator was in charge of each of the stores.

In Jaypurhat Khasmahals in the Bogra District a demonstrator was maintained by the Agricultural Department while the Malda Khasmahal maintained a demonstrator from their funds.

Schemes for the establishment of a Demonstration Farm in the Jalpaiguri Khas Mahals are under the consideration of Government.

Court of wards—The Kassimbazar Wards' Estate in the Rangpur District showed much activity in the introduction of Agricultural improvements in that Estate. It entertained a whole time demonstrator; maintained a seed store and did other useful work.

The Churamon Wards' Estate also maintained a whole time demonstrator and constructed a seed store in the year under report. Some useful demonstrations on *Kakya Bombai* jute, *Kataktara* and *Indrasail* paddy, Sugarcane and *Rabi* crops and useful manures were made.

The Janbazar Wards' Estate also entertained a whole time demonstrator and provided a store.

Agricultural Association.—Besides the 3 existing Agricultural Associations in Rangpur, Malda and Bogra—two were formed, one at Pabna and another at Natore.

The Rangpur Association showed great activities in Agricultural improvements, in providing seed stores, erecting curing sheds for Sumatra tobacco and in making arrangement and advancing money for fermenting the Sumatra tobacco grown by the cultivators, who could not manage to do so themselves.

The Association entertained two demonstrators for Agricultural Operations, and one Overseer in connection with the distribution of pure and disease-free eggs of Endi Worm.

The Malda Association also did some useful work by distributing about 1,400 lbs. of cotton seeds and 2,700 lbs. of Darjeeling seed potato.

Seed Stores—At present there are 8 district seed stores maintained by the Government and in charge of the respective District Agricultural Officers.

The utility of seed stores has been firmly established now, as will be evident from the increase in the number of rural seed stores, of which there are 13 already working.

12. **Exhibition.**—An exhibition was held at the Rajshahi Farm to acquaint the public with the measures taken by the Agricultural Department for the Agricultural improvements in the different Farms.

The idea of having such an Exhibition originally emanated from the Honorable Member in charge.

In the Annual Mela, held at Paikar an Agricultural show was arranged, where demonstrations were given on implements, manures and crops.

From the Agricultural point of view Rajshahi Division is a tract with great agricultural possibilities and steady progress along the lines advocated by the Department of Agriculture will greatly increase the wealth of the cultivating classes.

Merits of Officers and Acknowledgments.—I am much indebted to Babu Bhabatosh Dutt for the success of my administration in this Division. He has always worked loyally and cheerfully and I am glad to recommend his conduct to the favourable notice of the Director of Agriculture. The District Agricultural Officers and the Farm Superintendents also worked with honest devotion.

RAJESWAR DAS GUPTA,

Deputy Director of Agriculture.

APPENDIX IV.

Report of the Fibre Expert to the Government of Bengal for the year 1919-20.

Charges.

I held charge of the Fibre Expert's Section throughout the year under review. I also officiated as Director of Agriculture from the 14th May till the end of the year.

Tours.

I spent 142 days on tour and visited the experimental Jute plots on the Government Farms and at other places in the Presidency.

Manures for Jute on Acid red soils.

Central Mirpur Field Experiments:—In the *Kharif* season of 1919 no jute was grown on these plots which were sown with *Aus* paddy (*Kataktara*). The crop was a good one on all the plots and there was li ttle difference between the yields.

It see ms evident that the effect of lime and potash on *aus* paddy is not so considerable as on Jute : also that the action of phosphate on *aus* paddy is not so pronounced as on transplanted paddy.

In the present season (1920) Jute *C. Capsularis* is being grown on this series and striking differences are already visible between limed and unlimed plots.

Seed Jute.

Corchorus capsularis :—In the last season (1919-20) nearly 2,000 maunds (about 70 tons) of the seed of two strains of *Kakya Bombai* was raised. Of this about 1,500 maunds were ordinary *Kakya Bombai* seed, while there were about 500 maunds of the non-chlorotic strain R 85. No distribution in ¼ lb bags was made in the present year as, on account of the cyclone in Eastern Bengal, a certain shortage of Jute seed was anticipated. The whole of the seed produced was therefore sold. There was a great demand for it and it realized prices generally largely in excess of those paid for local seed. In Eastern Bengal the Departmental selling price was Rs. 20 per maund or As. 8 per seer.

It is satisfactory to note that the seed jute crop was again not seriously attacked by *Diplodia corchori*, and it would appear that comparatively late sowing is, in no small degree, a protective measure. After a careful consideration of the whole of the experimental results of the last three years, in consultation with the Ist and 2nd Imperial Mycologists, it was decided that the disinfection process of steeping the seed in copper sulphate solution, hitherto employed, may now be safely eliminated.

Owing to the increased profits to be obtained from sugar cultivation, the production of jute seed is not now so attractive to Bihar Planters as it was two or three years ago. In spite of our offering Rs. 12 per maund i.e. 50 per cent over what was originally paid, there will be markedly less cultivation of seed jute in Bihar in the present season.

As a result of an approximate census recently taken of the area underde partmental jute, it would appear that there were 1,35,000 acres of *Kakya Bombai* in Eastern Bengal and probably nearly 2,00,000 acres in the whole province.

Corchorus olitorius :—Besides the 2,000 maunds of *Kakya Bombai*, about 400 maunds (11 tons)of the seed of two pure line strains, of *Corchorus olitorius* viz: R. 26 and "Chinsurah Green" were also produced and sold. Contrary to custom, most of the *Corchorus olitorius*

seed was disposed of in Eastern Bengal, where the *Bogi* seed crop had been practically destroyed by the cyclone. Otherwise the distribution of "Chinsurah" Green in small packets would have been commenced.

Rs. I5 per maund is paid to growers of *Corchorus olitorius* seed but this is apparently not sufficient to enable seed jute to compete with sugar, as the area put down for seed in Bihar in the present season is considerably less than last year. It is interesting to note that, over I00 maunds ($3\frac{1}{2}$ tons) of the seed of R. 26 was produced last season in the Madras Presidency, and that a similar area of seed jute will be grown there in the present season.

Single plant Cultures.

In the season 1919 there were about 400 single plant cultures under investigation at the Dacca Farm. Of these the most important were the non-chlorotic strains, which have already enabled us to improve materially on the yielding power of the original *Kakya Bombai*. So promising indeed have the results with these strains been that chlorosis is now regarded as sufficient reason for the rejection of a plant. The cause of chlorosis is still a matter for argument among scientific men but in the case of jute, it seems to be associated in some way with the development of the root system. Non-chlorotic plants appear to have a highly developed surface root system, which is generally more or less lacking in chlorotic plants. The matter is still under investigation; but in the meantime it is certain that the tendency to chlorosis, or the reverse, is transmitted from parent to progeny in such a degree as to enable us to produce strains which are practically non-chlorotic.

The Economic Botanist is now taking up the investigation of chlorosis in jute with a view to elucidating the Mendelian aspect of it.

The question of cross-fertilization with a view to combining desirable qualities of two parent plants in a hybrid is still under investigation. Some promising fixed hybrids are now in process of multiplication, and would have come into variety tests this year if the greater proportion of their seed had not been lost in the cyclone. Under the circumstances it has been necessary to postpone the field tests for a year.

Variety experiments with Jute.

Dacca :—*Corchorus Capsularis, Series I, Mustul Field Experiments.*

In this series 7 races were compared in duplicate plots with a standard (R. 85) on either side of each. Three out of the seven races, though apparently growing as tall as the remaining four were much inferior in point of yielding power. The following races were the best :—

Name of race.	Average yield of duplicate plots.		Average yield of adjacent standard plots (R. 85).	
	Mds.	Srs.	Mds.	Srs.
D. 154	19	30	17	29
Kakya Bombai	16	5	17	14
D. 101	20	5	21	5

Thus D. 154, a new pure line of great promise, was better in these tests than R. 85 which itself was markedly the best yielder in the variety in 1918.

The above races are again being grown against each other in the present season with a view to reaching a final decision in regard to their respective merits.

Dacca :—*Corchorus Capsularis, Series II, West Shoti Experiments.*

This set of plots was put down to test the yielding power, and quality of the fibre of Kakya Bombai, against two races the seed of which was brought from tracts which produced fine jute viz :—Funduk on the Sylhet border and Simulkandi in Mymensingh. Plots sown

respectively with Funduk and Simulkandi seed, were compared with plots of Kakya Bombai on either side of each. The results in regard to yield are given below :—

Name of race.	Average yield of different plots.	
	Mds.	Srs.
Kaka Bombai Average of four plots	17	14
Simulkandi	13	26
Fundak	13	15

The Simulkandi and Funduk crops were both small, and flowered early as compared with the *Kakya Bombai,* which was markedly taller than either. All the plots were cut together and both the Simulkandi and the Funduk fibre were rooty, on account of their being rather over ripe. If however they had been cut earlier, so as to secure better fibre, the yields of both would undoubtedly have been still smaller than the figures given above. There seems to be some possibility that the smaller earlier maturing types may produce a rather finer fibre than the taller, later maturing varieties ; this point is under investigation.

RANGPUR CATTLE FARM.

Corchorus Capsularis.

Name of race.	Average of duplicate plots.		Average yield of adjacent standard plots (R. 85.)	
	Mds.	Srs.	Mds.	Srs.
D. 154	24	12	24	33
D. 136	22	27	24	3
Keranigunj	22	30	23	34
Kakya Bombai	19	20	21	24
Funduk	14	20	20	28

RANGPUR DEMONSTRATION FARM.

Name of race.	Yield.		Average yield of adjacent standard plots, (Kakya Bombai.)	
	Mds.	Srs.	Mds.	Srs.
R. 85	30	5	27	27
Dacca Bao	23	...	27	31
Simulkandi	16	33	28	16
Hewti (Rangpur)	20	...	28	10

These figures taken as a whole are very concordant. They indicate (I) that R. 85, which is a non-chlorotic strain of *Kakya Bombai*, is better than the original pure line of *Kakya Bombai* by an average of about 2 maunds per acre. They also indicate that D. 154 is probably equal to, and possibly better than R. 85. It is hoped to settle this point in the present year by tests which are in progress at Dacca and at Rangpur as well as at several jute agencies.

2 All the tests show that the Funduk and Simulkandi races are markedly inferior in yielding power to any of the departmental pure lines.

Dacca—Corchorus Olitorius, West Shoti Experiments:—

In this series three strains of red Rajshahi, or Serajgunj, *Tosha* viz., R 28, R. 30 & R 62 and one green strain of *desi* from Chinsurah, ("Chinsurah Green") were compared. Each red race was sown on duplicate plots on either side of which were plots of Chinsurah Green. There was little to choose between the crops as far as appearance, height etc., is concerned but the results given below, which are uniformly confirmed by others, shew that "Chinsurah Green" is a very markedly heavy yielder.

Name of race.	Average yield of duplicate plots.		Average yield of adjacent standard plots. (Chinsurah Green.)	
	Mds.	Srs.	Mds.	Srs.
R. 30	21	18	29	...
R. 62	21	35	27	36
R. 26	21	36	28	14

Rajshahi. Corchorus Olitorius.

This experiment is a duplicate of the one at Dacca. The results were as follows:

Name of race.	Average yield of duplicate plots.		Average yield of adjacent standard plots, (Chinsurah Green.)	
	Mds.	Srs.	Mds.	Srs.
R. 30	14	9	19	36
R. 26	17	7	20	15
R. 62	16	29	20	29

Chinsurah.

Name of race.	Average yield of duplicate plots.		Average yield of adjacent standard plots, (Chinsurah Green.)	
	Mds.	Srs.	Mds.	Srs.
R, 26	28	19	31	9
R. 30	25	17	31	17
R. 62	25	8	28	...

Rangpur.

Name of race.	Average yield of duplicate plots.		Average yield of adjacent standard plots, (Chinsurah Green.)	
	Mds.	Srs.	Mds.	Srs.
R. 62	23	12	26	12

There is thus no reason to doubt that the "Chinsurah Green" is the best race of *Corchorus olitorius* we have. As already remarked, its yielding capacity lies less in its capacity to grow taller than other races; than in the greater percentage of fibre which it contains. Usually the percentage of dry fibre in "Chinsurah Green" is between 6 per cent and 7 per cent in the whole freshly cut green plants, including leaves; whereas a corresponding proportion for the other races is between 5 per cent and 6 per cent or a difference of 20 per cent. The latter figure approximately represents the difference between the respective yielding powers.

"Chinsurah Green" has now been accepted for distribution on a large scale and it will certainly enable the jute cultivator who grows it to materially increase his profits.

Experiments with Jute at Muffussil Agencies of Calcutta Firms.

At Naraingunj Messrs. R. Sim & Co., carried out variety tests, the result of which confirmed those obtained at Dacca. Messrs. Landale and Clark repeated these tests at Sarisabari and Haldibari where the results were not so definite. Messrs. Sinclair Murray carried out spacing experiments to see if the quality of the fibre produced depends in any way on the number of plants growing on unit area of land i.e., on the thickness of the stem. The results of the latter experiments are still under investigation.

We are glad to again express our indebtedness to the above firms; also to the Manager of the mufussil agencies for their public spirited efforts, not only for superinteuding the experiments but for selling departmental seed to neighbouring cultivators.

Sunn Hemp.

This work has necessarily been restricted in the past year; but the experiments with a view to improving the process of extraction have continued and good progress has been made. The importance of the investigation has been referred to in previous reports and has, if any thing, increased, in consequence of the present high price of flax.

Sida.

Pure line selection of this fibre plant has continued and a trial in the Central Provinces resulted in a yield of about 6 maunds of fibre per acre. This is considerably less than is obtained at Dacca and the conditions, necessary for success in areas outside Bengal will be investigated.

Acknowledgment.

I have pleasure in reporting that Babus N. C. Bose and Tara Nath Roy have done excellent work during the year.

DACCA
The 4th July 1920.

ROBERT S. FINLOW, B. Sc., F.I.C.
Fibre Expert.

APPENDIX V.

Report of the Economic Botanist to the Government of Bengal for the year 1919-20.

I took over charge of the Section from Mr. Hector on 16th December 1919. Mr. Sharangpani continued in the post of 1st Assistant and Babu Kali Prosanna Roy as 2nd Assistant.

An additional post as 3rd Assistant was created and Babu Suresh Chandra Chakravarty, Farm Superintendent, Rangpur Cattle Farm, was appointed on probation.

Three additional Field Assistants were appointed, one of whom was posted at Chinsurah.

Tours.

Mr. Hector spent 90 days on tour and the Staff 163 days.

Rice.

The activities of the section continued to be chiefly occupied in work on rice.

Transplanted Winter Rice.

Dacca.—Work continued on the lines laid down in last year's report.

An investigation was commenced into the physical factors affecting the yield in rice. These experiments embrace the effect of transplantation at different distances apart, the time of transplantation and the number of seedlings per hole. These experiments, along with others to arrive at the water requirements, are being continued in the present season.

Three highly yielding varieties *Dudsur* and *Depi* and *Tilak Kachari* were tested on a field scale against *Dacca No. I. Dudsar* gave a slightly higher yield than *Indrasail* and as it ripens slightly earlier may prove of value in districts where early ripening is necessary. *Dudsar* is very similar in appearance to *Indrasail* and difficult to distinguish from it. The test will be continued.

Chinsurah.

The survey of the varieties grown in West Bengal was continued. *Nagra* and *Indrasail* were again compared. This year the yields were practically the same.

Aus Rice.

Kataktara continues to give very successful results in the districts. Supply of seeds could not meet the high demand. Work on crossing *Kataktara* with early ripening *aus* rices and early ripening *Aman* rices and *Indrasail* was continued.

Deep water Rices.

Preliminary work was continued on Deepwater *Aus* and *Aman* rices. Pure lines have been isolated.

Cotton.

The cotton plots were practically destroyed by the cyclone and work will have to be commenced again.

Chillis (*Capsicum Sp.*)

The chillis were also completely destroyed by the cyclone, all varieties being lost. Fresh seed has been obtained and work is being continued.

Other Crops.

Repeated experiments have shown that mung (*Phaseolus radiatus*) cannot be tested on the Dacca Farm and work will have to be taken up elsewhere.

Work on pulses, *Til* and Mustard was continued.

Fruits.

The Cyclone created havoc amongst the fruit trees.

Mangoes and Litchis are coming into full bearing and grafts from the best varieties will be made during the next year.

" Bullocks Hearts " proved a failure and have been removed.

Ufra.

Work was continued as in previous years.

Mycology.

Mycological Collector continued to be chiefly occupied with work on Ufra. Experiments with *Digha* paddies and transplantation of Deepwater *Amans* were undertaken. The results were inconclusive and will be continued.

A destructive disease in Chillis, identified by the Imperial Mycologist as *Vermicularia Capsicum*, accompanied by *Colletotrichum*, was reported from Faridpur and Backerganj Districts and the measures advocated by the Imperial Mycologist were applied on a field scale.

Entomology.

The Entomological Collector spent 170 days on tour in different parts of the Province investigating and prescribing for insect attacks.

Damage from Rice *Hispa* was reported from Backerganj and Faridpur Districts and demonstrations in bagging were carried out in both districts. Further investigation was carried out to find out measures to combat the mango *Weevil*. The work done in this subject by Babu Profulla Chandra Sen is recommended for notice. He has worked out the life-history of the pest and suggested remedial measures which should make it possible to obtain mangoes in the infested area.

K. McLEAN,
Offg. Economic Botanist.

Work done for Bengal by the Imperial Mycologist, Pusa, during the year ending March 31st 1920.

The Imperial Mycologist reports that apart from the work on jute, already fully dealt with in the Fibre Expert's report, no requests for advice have been received in the period under review.

Memo. of Insect Pests reported from Bengal during 1st April 1919 to 31st March 1920.

1. Letter dated 4th April 1919 from Messrs. De & Sons, Seedsmen and Florists, Calcutta, sending for identification and suggestion of remedial measures specimens of insects damaging *Albizzia* seeds. Two distinct species were found to be concerned in the attack, and they proved to be examples of *Bruchus sp.* Some suitable methods for storing the seeds were suggested.

2. Letter dated 7th May 1919 from Messrs. D. Waldie & Co., Konnagar, sending some litchi leaves which were found to be infested with the *Litchi Mite.* For detailed information regarding this pest, the firm was referred to the Agricultural Journal of India, Vol. VII, July 1912.

3. Letter dated 5th September 1919 from Mr. P. Ghosh, Khagra, Murshidabad, reporting that no crop can be grown on a big plot of his land which is infested with *termites* and requesting that a remedy to check depredation of the pest may be suggested. Suitable remedial measures were recommended.

4. Letter dated 10th October 1919 from Messrs. T. E. Bevan & Co., Ltd., Calcutta, requesting us to recommend anything which will keep off "Woolly Bears" from Piano felts. Fumigation with Carbon Bisulphide and subsequent storage with plenty of naphthaline were suggested, but on the Firm being unwilling to use Carbon Bisulphide, comparative tests with naphthaline, Pyrethrum Powder, Keatinge's Powder and Tobacco leafdust will be undertaken.

5 Letters dated 24th November and 3rd December 1919 and 14th and 20th March 1920, from Mrs. Drake, Serampore, sending for indentification specimens of cocoons of an insect eating the leaves of *Eugenia jambolana* which on rearing was found to be a hitherto undetermined species of *Antispila.* Its larva also was subsequently found by Mrs. Drake.

APPENDIX VI.

Report of the Agricultural Chemist, Bengal for the year 1919-20.

I took over charge of the office of the Agricultural Chemist from Mr. G. P. Hector on December 16th.

Staff.

Mr. G. B. Pal continued as 1st Assistant throughout the year; Babu Indu Bhusan Chatterjee as 2nd Assistant and Babu S. N. Bose as Bacteriological Assistant.

Tours.

Mr. G. B. Pal attended the Board of Agriculture in Calcutta and the Calcutta Exhibition. Both Mr. G. B. Pal and Babu Indu Bhusan Chatterjee toured during the period they were on Cyclone Relief work.

Provincial Soil Survey.

The soil survey of the Province has been continued owing to the absence of the officers on Cyclone Relief Work, and distraction from this work to other routine, progress has not been as rapid as is desirable.

It is necessary that this work should be pushed on and an extra assistant will be required to take up ordinary routine work whilst Mr. G. B. Pal and Babu Indu Bhusan Chatterjee confine themselves to soil Survey work.

Analysis of soils on Experimental plots on the Dacca Farm.

Work on the analysis of soils on Experimental plots was brought to a conclusion.

As a development of this work, analysis of the ash of plants grown on the plots have been made and future crops will be examined on the same lines.

Little variation was found between different plots as regards availability of phosphates when lime was applied, but dressings of lime increased the availability of potash.

The preparation and purification of reagents required for work on the critical examination of methods of estimation of potash, undertaken in connection with the proposed Fertilizers Act, have taken up considerable time owing to the inferior quality of reagents.

Analysis of juice of Sugarcane.

Analysis were again made of the juice of the different varieties of canes but owing to the cane being seriously damaged in the cyclone the results cannot be put in comparison with those of previous years.

Bacteriology.

Babu S. N. Bose was employed during the year in the Fibre Expert's section on work in connection with heart damage in jute.

Cyclone Relief Work.

Mr. G. B. Pal and Babu Indu Bhusan Chatterjee were employed on Cyclone Relief work for two months the former at Lohajang and the latter at Narayanganj.

This naturally dislocated work in the laboratory considerably but both officers gave great assistance during this period of distress.

The staff have worked very satisfactorily under somewhat trying conditions.

K. McLEAN,
Offg. Agricultural Chemist.

APPENDIX VII.

REPORT OF THE CHINSURAH FARM FOR THE YEAR 1919-20.

INTRODUCTION.—The farm is situated on the west of the East Indian Railway lines between the Chinsurah and Hooghly stations and is 3 miles off from the town of Chinsurah. The place is only 38 inches above the sea level and comprises of an area of 210 acres, of which 162 are under cultivation now, the rest being occupied by roads, buildings, etc.

SOIL.—The soil is mostly clay loam and fairly representative of the local prevailing type. It is fertile and capable of growing good crops.

IRRIGATION.—There were no irrigation facilities in the farm so long and it had to depend entirely on seasonable showers or the water held up in the ditches (used only in cases of extreme necessity). This year, however, the old silted up Jhills are being re-excavated and deepened and all the available earth utilised for the purpose of raising the fields on the eastern side of the farm along the railway lines. This will afford us a series of highland plots of which there was none in the farm and enough facilities for irrigation where necessary.

II. RAINFALL AND CHARACTER OF THE SEASON :—

Months.	Average normal rainfall at Sadar (3 miles off) in inches.	Actual fall recorded on the Farm.		Comparison with normal.	
		Rainfall in inches.	No. of rainy days.	Excess.	Deficit.
1919					
April	2.46	4.32	5	1.86	....
May	5.85	7.60	9	1.75	....
June	10.56	10.94	15	0.38	....
July	11.28	11.44	16	0.16	....
August	11.64	12.95	16	1.31	....
September	8.40	5.77	10	....	2.63
October	4.09	1.12	2	....	2.97
November	0.66	1.17	2	0.51	....
December	0.19	Nil	Nil	....	0.19
1920					
January	0.38	Nil	Nil	....	0.38
February	1.20	2.39	4	1.19	....
March					

The season started very favourably but the more or less droughty condition prevailing from September to January greatly affected the outturns of all crops.

III. OPERATIONS DURING THE YEAR :—

1. Standardisation of plots.
2. Varietal test with—
   (a) Aus Paddy.
   (b) Jute.
   (c) Sugarcane.

3. Manurial experiment on Nagra Paddy.

4. Seed production—
   (a) Aus Paddy.
   (b) Aman Paddy.
   (c) Jute.
   (d) Sugarcane.

5. Rabi crops, including potatoes.

6. New crops—
   (a) Cotton.
   (b) Groundnut.
   (c) Joar.
   (d) Arhar.

7. Trials with pure line varieties of paddy were conducted on 11.62 acres of land, under the guidance of the Economic Botanist. The results of these will be found in his report.

1. As in the two previous years Block A was grown with Nagra Paddy in order to find whether the different plots therein were uniform for experimental purposes. From the results of the last 3 years it may now be asserted that the plots are still uniform and will require further manipulation for being standardised.

(a) Aus Paddy Varietal Test.—E. B.'s Kataktara was tried against the two well-known local varieties of Aus named Gangajali and Kele. From the results given below it will be seen that Gangajali yielded better than Kataktara. The experiment will be repeated next season.

Name of variety.	Outturn per acre.					
	Grain.			Straw.		
	Mds.	Srs.	lbs.	Mds.	Srs.	lbs.
Kataktara	24	36	2,041	32	18	2,660
Gangajali	27	16	2,246	36	38	3,029
Kele	24	0	1,968	34	0	2,788

Jute (Corchorus Olitorious) Varietal Test.—Different varieties of jute tried and their outturns are stated in the table below. It will be seen that Green Olitorious, a product of the locality, has special advantages. Its extension will be encouraged.

No. of plot.	Variety.	Actual weight of fibre in lbs.	
		Each plot.	Per acre.
1.	Green Olitorious	174	2,320
2.	R .26	194	2,586
3.	Green Olitorious	207	2,760
4.	R .26	155	2,066
5.	Green Olitorious	194	2,586
6.	R .30	164	2,186
7.	Green Olitorious	196	2,613
8.	Ditto	178	2,373
9.	R .30	149	1,986
10.	Green Olitorious	188	2,506
11.	R .62	154	2,053
12.	Green Olitorious	172	2,293
13.	R .62	154	2,053
14.	Green Olitorious	154	2,053

SUGARCANE (SACHARUM OFFICINARUM)—

Eight different varieties of canes were grown in duplicate plots with Yellow Tanna as standard on .025 acre plots. The crop suffered greatly in the early stage of growth from excessive rainfall and from the more or less droughty conditions from October to January, *i.e.*, at the latter stage of growth when they had to be irrigated. Yields, however, on the whole were not unsatisfactory, as will appear from the table below.

(0.025 acre each plot.)

Plot.	Name of variety.	Weight of cane in lbs.	Weight of Juice in lbs.	Weight of Gur in lbs.	Yield Gur per acre in lbs.
1.	Stripped Tanna	1,341	927	201	8,009
2.	Yellow Tanna	1,539	1,023	223	9,137
3.	Shamsara	718	482	88	3,536
4.	Yellow Tanna	1,653	1,154	247	9,937
5.	Dacca Gandari	769	490	102	4,105
6.	Yellow Tanna	2,055	1,403	276	11,000
7.	Dacca Gandari	985	671	123	4,986
8.	Yellow Tanna	1 800	1,181	229	9,194
9.	Shamsara	597	417	78	3,146
10.	Yellow Tanna	1,798	1.093	188	7,554
11.	B. 208	922	616	122	5,617
12.	Yellow Tanna	1,810	1,249	260	10,434
13.	B. 208	1,085	701	124	4,991
14.	Yellow Tanna	1,610	1,069	184	7,396
15.	Vendamukhi	959	600	105	4,223
16.	Yellow Tanna	1,654	1,132	215	8,610
17.	B. 3412	1,280	847	130	5,232
18.	Yellow Tanna	1,645	1,025	206	8,256
19.	Vendamukhi ..	1,389	991	191	7,677
20.	Yellow Tanna	1,681	1,086	198	7,879
21.	B. 147	1,234	835	153	6,109
22.	Yellow Tanna	1,432	909	189	7,600
23.	Red Mauritius	985	671	123	4,986
24.	Yellow Tanna	1,580	974	209	8,313
25.	B. 3412	1,133	735	125	5,002

It will be seen that Yellow Tanna gave the highest yield. This variety has gained great favour with neighbouring cultivators for its sturdy character combined with high yielding capacity. Shamsara, the best local cane, only stands third in order of merit being beaten by B. 3412, which also comes next to Yellow Tanna.

Among the soft (chewing) canes, *viz.*, B.208, B.147, Dacca Gandari and Vendamukhi, the first two seem to be better than Gandari and Vendamuki. But they are both very delicate canes and more liable to attack of insects and wild animals.

Red Mauritius is a very good cane but it is very susceptible to insects and fungus pests and is of a very tender habit.

3. MANURIAL EXPERIMENTS.—The object was to find out the relative value of Dhaincha as a green manure for paddy vs. cowdung, castor cake, and I.O.P.

From the results stated below castor cake will be found to have given the best result but the increased outturn cannot be justified on economic consideration. Next to castor cake Dhaincha green-manuring has been the more effective, and its cost being very small, *viz.*, Re. 1-8 per acre, is the most economical manure for paddy. Last six years' result noted below also corroborate the statement.

Manures applied per acre.	Average Outturn per acre in maunds of 82 lbs.											
	1912-13.		1913-14		1914-15.		1915-16.		1916-17.		1917-18.	
	Grn.	Str.	Grn.	Str.	Grn.	Str.	Grn.	Str.	Grn.	Str.	Grn.	Str.
Unmanured ..	21	30	24	32	14	25	18	23	12	11	31	39
Cowdung @ 100 mds. ..	23	37	33	44	17	28	24	27	14	15	27	42
Dhaincha Green-manured ..	29	46	29	34	18	34	29	36	17	17	33	48

4. Seed Production—

(a) Aus Paddy (Kataktara).—14.92 acres were cropped with selected strains of Economic Botanist's Kataktara. It grew fairly well, and though somewhat affected by unfavourable weather conditions an outturn of 984 lbs. (12 maunds) per acre was obtained.

(b) Aman Paddy.—44 acres of land were put under Indrasail for multiplication of pure seeds. An outturn of 1,726 lbs. (21 maunds 2 seers) per acre was obtained. The small outturn is attributable to the droughty condition prevailing during the flowering and fruiting period.

(c) Jute.—D.154 and Green Olitorious were grown on 1.7 acres of land for seed production and 1,225 lbs. (12 maunds 20 seers) obtained.

(d) Sugarcane.—An area of 2.15 acres was allotted for seed propagation and 65,500 sound sets of high class foreign canes were supplied to various parts of the circle for demonstration. The demand for cuttings of the foreign varieties was far in excess of the supply. An area of about 8 acres will be put under cane during the ensuing year to meet the increased demand.

5. Rabi Crops including Potatoes.—This is the first year that Rabi crops have been tried in this farm. In spite of unfavourable weather conditions encouraging results have been obtained. Darjeeling and Nainital potatoes were tried, the Darjeeling variety giving a decidedly better outturn.

Gram.—A fair crop was harvested with an outturn of 984 lbs. of gram per acre.

Linseed.—Although affected by unfavourable weather conditions due to the absence of rain in October an outturn of 492 lbs. per acre was obtained. The crop is expected to do well here.

Lentil.—Yield obtained was 328 lbs. per acre. Will be tried again.

Mustard.—Practically no harvest, all plants having died on account of the drought in October.

Barley.—A crop of 676 lbs. per acre was obtained. Promises well. Should be continued.

Wheat.—An yield of 686 lbs. of grain per acre was obtained. Considering the weather conditions the result is rather encouraging.

6. Other Trials—

(a) Cotton.—Buri and Dharwar cottons were tried on 0.30 acres of land during the year under report. The results (outturn in lint) obtained are not satisfactory although the plants grew well. Flowers and bolls came in very late. On the whole Buri fared better than Dharwar. Up to date seven seers of Buri and five seers of Dharwar have been picked. Many bolls have yet to mature.

(b) Croundnut.—A trial was made with following varieties:—(a) Big Japan, (b) Spanish, and (c) Pondicherry. Although the outturn was very low, perhaps due to the clayey nature of the soil Big Japan yielded best. This will be repeated next year.

(c) Joar.—This fodder crop was raised for the first time on this farm. Part of it was given to the cattle but the major portion ensilaged in pits at the request of the Divisional Association by way of a demonstration that such cattle food could be preserved and used with advantage when green fodder was scarce. Samples of this silage were sent to the Suri and Benjatia Exhibitions where these were highly appreciated.

(d) ARHAR.—Pure line tests with selected varieties of Arhar was started under the guidance of Mr. H. P. Mitra, but as he was absent on leave practically all the time and left no instructions, nothing much could be done.

BANANA.—A good many varieties of the famous Rampal (Dacca) varieties were tried. The Amrita Sagar is discarded as unsuitable to local conditions on account of its very delicate habits. The others will be tried again with a view to find out the most suitable variety.

PAPAYA.—The plantation of papaya has been renewed with the Ceylon and Bangalore varieties; both doing very well.

IV. DISTRIBUTION OF SEEDS—

The following seeds and manures were distributed during the year under report.

		Mds.	Srs.	Ch.
1.	Seeds—			
	(a) Paddy—			
	1. Indrasail	84	25	0
	2. Nagra	33	10	0
	3. Badshabhog	6	6	1
	4. Samudrabali	1	12	0
	5. Dadkhani	3	27	8
	6. Kataribhog	3	2	0
	7. Kaminishal	0	20	0
	8. Hatishal	2	7	0
	9. Jhingashal	1	0	0
	10. Jatakalma	0	2	0
	11. Kataktara	0	5	0
	12. Doubled rice paddy	0	2	0
	(b) Wheat	0	20	0
	(c) Pulses—			
	1. Rahar	0	12	0
	(d) Jute seeds, etc.—			
	1. Hooghly Desi	0	20	0
	2. Sunn hemp	0	7	0
2.	Manures—			
	1. Bonemeal	1	11	8
	2. Sulphate of ammonia	0	4	0

V. MISCELLANEOUS—

1. CATTLE.—There were 52 head of bullocks of which eight are old and infirm and unfit for work. It is absolutely necessary to replace them. The general condition of the cattle on the whole was good. There were four casualties during the year under report due to old age.

2. FISHERY.—Fish culture was carried on under the guidance of the Director of Fisheries. Rohit appear to be thriving best.

POULTRY.—A few Black Langshang and the Chittagong birds are being reared. Four cocks and seven hens of the Black Langshang variety were sold during the year under report. If poultry is to be reared better arrangements ought to be made.

PRACTICAL TRAINING IN AGRICULTURE.—During the year under report 20 young men were on practical training in the Farm. An Agricultural Vernacular School also is going to be opened shortly for agricultural education to the sons of cultivators. The construction of the school buildings, already in progress, is expected to be completed before the end of 1920.

4. A provincial Agricultural Conference presided over by the Divisional Commissioner was held on the Farm in September last with great success. Delegates from *bona fide* cultivating and farming classes from various parts of the circle attended the conference. The Collectors of different districts were also present. Everybody took keen interest in the deliberations and in the practical demonstrations

given. E. B.'s Paddy variety and the T. E. Jute experimented were viewed with great interest.

Visits and Inspections.—The Deputy Director of Agriculture inspected the farm very frequently and the Director paid four visits. The farm was also inspected by the Fibre Expert, Economic Botanist, the Divisional Commissioner, the Collector and the Members of the Indian Sugar Committee.

Establishment.—Babu Chuni Lal Mustafi held charge of the farm till the close of May when he made over charge to Babu Rabindra Kumar Shome, Assistant Superintendent, who held temporary charge till Babu Hiran Kumar Basak took over from him on the 14th June, 1919. The latter was relieved by Babu K. C. Guha on the 18th September, who has been in charge since. On account of the increase of experimental and research work two Assistant Superintendents were also entertained. Besides these there were three farm overseers and a clerk to help in office work.

CHINSURAH AGRICULTURAL STATION.

FINANCIAL STATEMENT for the year 1919-20.

RECEIPTS.

	Rs.	A.	P.
Total amount credited to the Treasury	10,993	4	6
Receipts by Stock Transfer	56	7	0
Bills outstanding for the year	596	5	0
Value of Stock on 31-3-20	3,477	0	0
Total	15,123	0	6
Bill outstanding for the previous years	234	11	3
	15,357	11	9
Deduct receipts on account of previous years	2,715	9	6
Net amount for the year	12,642	2	3

EXPENDITURE.

	Rs.	A.	P.
1. Purchase and feed of cattle	1,800	0	0
2. Purchase of Seeds, Manures and Implements	2,174	0	0
3. Wages of Labourers	16,731	6	11
4. Allowances of Apprentices	1,268	9	1
5. Laying out and Reclamation	2,333	12	0
6. Petty Constructions and Repairs	402	0	0
7. Railway and Steamer Freight	175	7	6
8. Cooly and Cart Hire	20	6	9
9. Medical Aid	32	11	0
10. Service Postage Stamps	60	0	0
11. Hot Weather Charges	4	0	0
12. Purchase and Repair of Furniture	100	0	0
13. Office Expense and Miscellaneous	1,620	1	9
14. Economic Botanist's Work	1,066	4	0
Total	27,788	11	0

APPENDIX VIII.

REPORT OF THE BURDWAN FARM FOR THE YEAR 1919-20.

1. **Introduction.**—The farm is situated at a distance of about 4 miles south-east of the civil station of Burdwan. It was opened in the year 1885 and is the oldest farm in Bengal. It is owned by the Hon'ble Maharajadhiraj Bahadur of Burdwan who kindly bears the expenses of the farm, but the entire management is in the hands of the Agricultural Department.

During the year under report the farm was laid out into uniform standard plots of 1 acre each as far as possible, and it was converted as a Demonstration Farm of the District. The farm is a narrow block of land, with very irregular boundaries, and unless some more lands are acquired and the boundaries strengthened it will not be possible to lay it out properly. There is no fencing and as a result crops are damaged by stray cattle and wild animals.

Area.—The total area of the farm is 32 acres, of which 25 acres are cropped, comprising of 4 acres high and 21 acres low land. Naturally there is not much scope for trying experiments and demonstrations with upland crops.

Soil.—The analysis of the soil which is a poor sandy loam in texture will be found below from which it will appear that it is poor in nitrogen, phosphoric acid, and lime, but rich enough in potash.

	Soil. 1st 9 in.	Sub-soil. 2nd 9 in.
Insoluble silicate and sand	88.52	87.47
Ferric Oxide	3.60	3.68
Alumina	4.42	5.27
Lime	.34	.33
Magnesia	.34	.31
Potash	.31	.32
Soda	.09	.07
Phosphoric Acid	.02	.03
Sulphuric Acid	.01	.01
Carbonic	.04	.06
Organic matter and combined water	2.31	2.45
Total	100.00	100.00
Available Potash	.04	.02
Available Phosphoric Acid	.002	.001
Nitrogen	.011	.007

Irrigation and Drainage.—During the year under report the farm suffered very badly from the ingress of the water of the Eden Canal which runs along the entire length of the farm. Whenever water level of the canal was raised during the monsoon, water would rush into the farm through numberless holes in the bund and for days together the entire farm would

remain under 2 to 3 feet of water. This spoiled the sugarcane crop altogether and damaged other crops also more or less seriously.

2. **Rainfall and Character of the Season.**—The following table gives the rainfall on the farm during the year. The season was unfavourable for paddy. The failure of rain in October and November greatly affected the outturn.

Name of the months.	Actual rainfall in inches during 1919-20.	Actual number of rainy days during 1919-20.	Normal rainfall of 40 years.	Normal rainy days of 40 years.
April 1919	2.82	5	2.20	3
May 1919	7.40	7	5.56	6
June 1919	7.85	13	10.70	12
July 1919	16.86	18	12.32	15½
August 1919	13.82	16	11.49	15½
September 1919	7.89	9	8.59	11
October 1919	0.86	3	3.93	4
November 1919	Nil	Nil	0.64	¾
December 1919	„	„	0.13	¼
January 1920	„	„	0.38	¾
February 1920	0.95	3	0.89	1½
March 1920	8.25	8	1.24	1¾
Total	66.70	82	58.07	72

3. **Operations of the year.—**

(1) Experimental work.

(2) Production of improved seeds.

(1) Experimental work with the following crops were taken up during the year:—

(a) Paddy, (b) Jute, (c) Groundnuts, (d) Arhar, and (e) wheat.

Paddy, jute and groundnut were more or less a total failure on account of the continuous flooded condition of the farm during the growing period and no definite conclusion can therefore be safely arrived at. Arhar was grown for the first time in the farm, and the outturn obtained shows that it is quite suitable to the locality. The brown and white varieties of Comilla Arhar were grown side by side for determining their comparative yield.

The following results were obtained :—

Variety.	Area.	Actual outturn obtained.			Outturn per acre.
		Mds.	Srs.	Chs.	
Comilla White	0.3 acre	3	14	0	11 Mds.
„ Brown	0.3 „	2	38	0	10 „

Wheat also was tried for the first time in the farm. Although the crop suffered from drought during the whole of the *Rabi* season still the results have not been very discouraging. Pusa Nos. 4 and 12 were tried with the following results. No. 4, which is an early flowering variety, seems to be more suited to the locality.

Variety.	Area.	Actual outturn obtained.			Outturn per acre.	Remarks.
		Mds.	Srs.	Chs.		
Pusa No. 4	2 acres	0	26	12	3½ Mds.	Affected by drought.
„ „ 12	2 „	0	24	0	3 „	Ditto.

(2) During the year the following quantities of improved paddy were raised for distribution among the cultivators:—

Kataktara Aus	28 Mds.
Indrasail	150 „
Nagra	8 „

4. **Distribution of Seeds.**—During the year under report 28 maunds of Kataktara, 158 maunds of Indrasail and 8 maunds of Nagra paddy seeds were distributed by this farm.

5. **Miscellaneous.**—*Cattle.*—

(a) The live-stock of the farm consists only of 3 pairs of fairly old bullocks.

(b) Conference, Exhibitions, etc.

A conference of the President Panchayats of the District was held on the farm during the year. The then Collector of the District (Mr. Birley) took great interest and showed everybody round. The Deputy Director, Superintendent of Agriculture, as also all Revenue Officers of the District were present.

An Agricultural and Industrial Exhibition was held at Burdwan towards the end of January, 1920, and a fair collection of farm produce was exhibited.

(c) Visits and inspection.—The farm was visited by the Hon'ble Mr. J. G. Cumming, Member of the Bengal Council, and Mr. J. N. Gupta, Commissioner of the Burdwan Division. The Deputy Director of Agriculture, Western Circle, and the Superintendent of Agriculture, Burdwan Division, inspected the farm frequently.

6. **Establishment.**—Babu Jamini Nath Chakravarty was in charge up to the end of October when Babu Sankar Prosad Bhattacharya was temporarily placed in charge of the farm till December. It has since been placed under the charge of the District Agricultural Officer of Burdwan with an overseer to assist him.

7. **Receipt and Expenditure.—**

The following statement shows the receipt and expenditure of the farm during the year:—

RECEIPT.

	Rs.	As.	P.
Receipt as opening balance ..	422	2	7
Burdwan Raj grant ..	2,500	0	0
Sale-proceeds of the farm produce ..	1,050	12	7
Bills outstanding on 1-4-20 ..	37	5	0
Value of stock in hand	315	0	0
Total ..	4,325	4	2

EXPENDITURE.

	Rs.	As.	P.
Establishment ..	561	0	7
Petty construction and repairs ..	124	15	3
Purchase and repair of implements ..	218	15	3
Wages of labourers ..	1,080	4	10
Cattle food ..	78	12	0
Seeds	102	14	6
Manures ..	54	6	0
Rent and taxes ..	8	12	9
Postage stamps ..	18	6	0
Reclamation ..	1,310	3	3
Railway Freight ..	14	13	0
Travelling allowances	246	3	9
Miscellaneous ..	150	10	0
	3,970	5	2
Balance in hand ..	354	15	0
Total ..	4,325	4	2

APPENDIX IX.

REPORT OF THE DACCA CENTRAL FARM FOR THE YEAR 1919-20.

INTRODUCTION.—The site of the Farm was selected in December, 1906, by Rai B. C. Basu Bahadur and was approved, after inspection, by Sir Bampfylde Fuller, the then Lieutenant-Governor of Eastern Bengal and Assam, and Mr. F. A. Sly, the then Inspector-General of Agriculture.

Besides serving as an experimental station, the Farm is the headquarters of the Expert Staff of the Department.

DESCRIPTION OF THE FARM.—The Farm comprises a compact block of land 353.7 acres (1,070 bighas) in area, situated between the Mirpur and the Mymensingh roads, 5 miles to the north of the Dacca Railway Station near the village of Manipur. The land was acquired at a cost of Rs. 70,043. At the time of acquisition the greater portion of the area was under thatching grass, scrub jungle and mango topes, the remainder being cultivated land. The large area of jungle has since been reclaimed and the lands have been levelled and regular fields laid out. At present there are 215 acres under cultivation, the remainder being under roads, buildings and pasture.

SOIL.—The soil of the Farm is stiff red laterite which extends over a considerable tract including the Madhupur jungle and the Barind tract in the Rajshahi Division. In the dry season the characteristic red clay sets hard like cement and loses moisture rapidly. It is deficient in organic matter. The soil in the low lands is more productive than that of the high lands owing to continuous deposits. The low lands are suitable for transplanted winter paddy, whilst jute, aus paddy, til and mustard are grown on the high lands. As soon as the rains end the land sets like brick so the local ryots generally leave rabi cultivation severely alone.

BUILDINGS.—At present there are 26 quarters for the Farm staff, the Laboratory Assistants and clerks. The appointment of additional Assistants on the Expert's staffs necessitates construction of new quarters. The construction of additional quarters has been sanctioned by Government and work will be commenced when funds are available.

An area of over 9 acres has been set apart for the Agricultural Vernacular School, which was started on the 15th January, 1920.

LAYING OUT.—The work of levelling uneven fields has been continued, two fields having been completed during the year.

RAINFALL.—A table showing the rainfall recorded during the year is given in Statement I. It will be seen that the season was favourable at the outset for aus paddy, jute and sugarcane. The rainfall was deficient in May, June and July which hampered the growth of the crops to some extent and delayed the transplanting of aman paddy. About 17 acres of the intermediate land could not be transplanted.

CYCLONE.—The cyclone which passed over the Farm on the 24th and the 25th September, 1919, accompanied by heavy rain damaged sugarcane severely and the transplanted winter paddy in the intermediate land to some extent.

The Farm office, godowns, cattlesheds and the residential quarters were all blown down and there was great loss of stored paddy, manures, etc. The buildings and quarters have since been temporarily repaired. Subsequent to the cyclone the question of labour became very acute and great difficulty was found in clearing up and in reconstruction.

OPERATIONS DURING THE YEAR. *Varietal Tests.*—(a) Paddy (Oryza sativa).—The greater part of the high lands was put under Kataktara paddy. Charnock and Suryamukhi aus paddies, both selections of the Economic Botanist, were grown on 1.33 and 1 acre respectively for multiplication. Charnock is a fine paddy whilst

Suryamukhi resembles Kataktara except in that the straw remains green when the ears are mature and that the tips of the grains are black. The outturns of Kataktara, Charnock and Suryamukhi were 1,200 lbs., 720 lbs., and 960 lbs., respectively. Transplanted winter paddy (Indrasail or Dacca No. 1) was grown on the greater part of the low lands, the outturn averaging 1,920 lbs. per acre. In the East Ravine Tilak-kachari, Dhepi, and Dudsar, heavy yielding selections of the Economic Botanist, were tested against Indrasail. The outturns of these varieties are given in Statement II. This test will be repeated this year for corroboration of the results.

(b) Sugarcane (Sachharum Officinarum).—The examination of Bengal and exotic sugarcanes was continued on 1-20th acre plot. The cane was so severely damaged by the cyclone that no results could be obtained. The crop only gave sufficient cuttings for the next season's propagation.

(c) Jute (Corchorus capsularis and Corchorus olitorius).—Varietal tests are conducted by the Fibre Expert. Details will be found in his report.

Experiments.—(a) Permanent manurial experiments initiated by Messrs. Birt, Basu and Meggitt were continued.

(i) Mr. Birt's experimental plot was laid out in 1911. The experiment—essentially a soil improvement scheme and not merely a study of the particular manurial requirements of one or two crops only—is to arrive at the lime requirements of the old alluvial red acid soils in conjunction with applications of Nitrogen (*i.e.*, Green manure and cowdung) and Phosphates, *i.e.*, Bonemeal. Special attention is paid to the effect on the production of rabi crops. The plot consists of four blocks A, B, C, D (*vide* Diagram Statement III and of these A and D grow green manure crop in alternate years.

(ii) Mr. Basu's experimental plot was laid out in 1908. This is also a soil improvment scheme with the addition of lime to neutralise the acidity of the soil. There are four plots, two of which grow a green manure crop in alternate years. Of the remaining two, one receives Nitrogen in the form of cowdung and the other in the form of decayed organic matter.

A reference to the diagram of the plot in Statement IV will explain the details.

(iii) Mr. Meggitt's experimental plot was laid out in 1911. This is another scheme for soil improvement. Lime was added when the experiment was first laid out and since then the plot has received no more lime. Phosphoric acid is applied as bonemeal and flour phosphate and Nitrogen is applied in the form of cowdung. There are 9 plots of which 3 get bonemeal and cowdung; 3, flour phosphate and cowdung; 2, cowdung alone; and 1 gets no manure (Statement V).

(b) Applications of bonemeal and rock phosphate supplemented by a top-dressing of ammonium sulphate with a view to testing the effect of applications of Nitrogen before sowing and during the growth of the plant were conducted this year on aus paddy. The results are given in Statements VIA and VIB.

(c) The results obtained by the use of steamed and unsteamed bonemeal, oilcakes, rock phosphate, bone-ash and shrimp waste on transplanted aman paddy will be found in Statement VII. This experiment will be continued as the crop was partly damaged by the cyclone mentioned above.

Fodder.—About 16 acres were put under fodder crops—8 acres under Juar and the rest under cowpea. Juar in the green stage was ensilaged in underground pits and is giving excellent fodder for the cattle. Cowpea was fed direct to the cattle.

Miscellaneous. (a) Cattle.—There was an outbreak of rinderpest and 18 animals were attacked—of these 3 succumbed. All the animals were inoculated with anti-rinderpest serum. There were six more deaths from various causes:—

Compound fracture of the pelvis	1
Bronchitis	1
Sunstroke	2
Killed in the cyclone	2

(b) Practical Training in Agriculture.—27 boys received a practical training in agriculture during the year. A number of them readily picked up the work and they are not afraid of hard manual labour.

(c) The Panchayati Conference of the District—Was held at the Farm, His Excellency the Governor of Bengal presiding. A handbook detailing the experiments

conducted on the Farm and a leaflet on water hyacinth were distributed amongst the Panchayats who were taken round the Farm to see the crops.

(d) Visits.—The Farm was visited by His Excellency the Governor of Bengal, the Hon'ble Mr. M. C. McAlpin, the Hon'ble Sir Frank Carter, the Hon'ble Mr. Murray, Mr. J. T. Donovan, Registrar, Co-operative Societies, Bengal, the Commissioner of Dacca Division, the Collector of Dacca and others. The Imperial Mycologist visited the Farm twice.

(e) Establishment.—Babu Santi Prosad Sen-Gupta remained in charge of the Farm during the year and proved industrious and capable.

Munshi Abdul Jalil was appointed as Assistant Farm Superintendent to supervise experimental work.

(f) Receipts and Expenditure.—The total receipts of the year amounted to Rs. 2,256-10-3 excluding the value of Kataktara and Indrasail paddy seeds made over to the Seed Store. The expenditure was Rs. 48,350 including capital charges, repairs to buildings and quarters damaged by the cyclone, laying out, etc.

KENNETH McLEAN,
Deputy Director of Agriculture,
Eastern Circle, Dacca.

STATEMENT I.

Rainfall from February, 1919, to January, 1920.

	Normal.		Actual.		Remarks.
	Rainfall in inches.	Number of rainy days.	Rainfall in inches.	Number of rainy days.	
1919.					
February ..	1.12	1.8	nil	nil	
March	2.59	3.5	nil	nil	
April	4.88	6.7	6.20	7	
May	9.60	11.3	5.30	11	
June	13.38	15.2	4.35	16	
July	12.85	15.75	5.34	24	
August	12.55	17.40	10.25	23	
September ..	9.43	11.70	14.29	15	Rain gauge was blown away on the 24th by cyclone.
October	4.91	5	2.26	6	
November ..	0.81	1.1	1.50	2	
December ..	0.15	0.4	nil	nil	
1920.					
January	0.38	0.9	nil	nil	

STATEMENT II.

Varietal Test, East Ravine, 1919-20.

Name of Variety.	Number of plots.	Area of plots in acres.	Actual outturn in pounds.	Outturn per acre, in pounds.
Tilak-kachari	6	.67	1,422	2,122
Dhepi	6	.73	1,556	2,131
Dudsar	6	.63	1,669	2,649
Indrasail	6	.69	1,590	2,304

STATEMENT III.

NORTH HAZI Mr. BIRT'S EXPERIMENTAL PLOTS, 1919-20.

(Blocks A and D grew a crop of Sunn hemp for green manure. The plain figures indicate outturn of Aus paddy and the bold figures outturn of Mustard. Yield per acre of plot 1/16th acre each.)

D

	4	3	2	1
d	**160 lbs.**	**136 lbs.**	**320 lbs.**	**64 lbs.**
c	**64 lbs.**	**362 lbs.**	**416 lbs.**	**48 lbs.**
b	**80 lbs.**	**320 lbs.**	**448 lbs.**	**48 lbs.**
a	**8 lbs.**	**160 lbs.**	**192 lbs.**	**8 lbs.**

B

	4	3	2	1	
d	416 lbs. / **144 lbs.**	384 lbs. / **368 lbs.**	320 lbs. / **320 lbs.**	592 lbs. / **192 lbs.**	60 mds. of Lime per acre every 6th year.
c	608 lbs. / **96 lbs.**	664 lbs. / **224 lbs.**	292 lbs. / **160 lbs.**	76 lbs. / **272 lbs.**	30 mds. of Lime per acre every 3rd year.
b	704 lbs. / **160 lbs.**	624 lbs. / **336 lbs.**	84 lbs. / **192 lbs.**	180 lbs. / **96 lbs.**	10 mds. of Lime per acre every year.
a	126 lbs. / **208 lbs.**	1,104 lbs. / **96 lbs.**	592 lbs. / **96 lbs.**	268 lbs. / **112 lbs.**	No Lime.

C

	4	3	2	1
d	496 lbs. / **176 lbs.**	336 lbs. / **368 lbs.**	148 lbs. / **432 lbs.**	124 lbs. / **32 lbs.**
c	704 lbs. / **96 lbs.**	1,048 lbs. / **480 lbs.**	224 lbs. / **320 lbs.**	192 lbs. / **48 lbs.**
b	884 lbs. / **72 lbs.**	832 lbs. / **416 lbs.**	92 lbs. / **224 lbs.**	44 lbs. / **80 lbs.**
a	1,168 lbs. / **8 lbs.**	1,408 lbs. / **416 lbs.**	368 lbs. / **64 lbs.**	28 lbs. / **8 lbs.**
	100 mds. of Cowdung per acre.	3 mds. of Bonemeal and 100 mds. of Cowdung per acre.	3 mds. of Bonemeal per acre.	No manure.

A

	4	3	2	1	
d	**272 lbs.**	**480 lbs.**	**320 lbs.**	**32 lbs.**	60 mds. Lime.
c	**64 lbs.**	**240 lbs.**	**528 lbs.**	**32 lbs.**	30 mds. Lime.
b	**128 lbs.**	**448 lbs.**	**352 lbs.**	**32 lbs.**	10 mds. Lime.
a	**32 lbs.**	**160 lbs.**	**144 lbs.**	**224 lbs.**	No Lime.
	100 mds. of Cowdung per acre.	3 mds. of Bonemeal and 100 mds. of Cowdung per acre.	3 mds. of Bonemeal per acre.	No manure.	

STATEMENT IV.

MANURIAL EXPERIMENTS, Mr. BASU'S PLOT, 1919-20.

Crop:—KATAKTARA AUS PADDY.

Yield per acre of plots (1|4th acre each).

3 Bonemeal. 320 lbs.	A	**1** Nil 312 lbs.
4 Lime and bonemeal. 564 lbs.		**2** Lime, no manure. 540 lbs.
3 Bonemeal, lime and green manure. 760 lbs.	B	**1** Lime and green manure. 796 lbs.
4 Bonemeal and green manure. 732 lbs.		**2** Green manure. 444 lbs.
3 Bonemeal and green manure. 704 lbs.	C	**1** Green manure. 580 lbs.
4 Bonemeal, lime and green manure. 804 lbs.		**2** Lime and green manure. 1,180 lbs.
3 Bonemeal and lime. 740 lbs.	D	**1** Bonemeal and lime. 816 lbs.
4 Bonemeal. 408 lbs.		**2** Nil 374 lbs.

Rate of manure applied.

Lime .. 10 mds. per acre.
Bonemeal .. 3 „ „ „

STATEMENT V.

NORTH HAZI Mr. MEGGITT'S EXPERIMENTAL PLOTS, 1919-20.

Crop:—KATAKTARA AUS PADDY.

Yield per acre of plots (area of each plot noted in the diagram).

N

9	8	7	6	5	4	3	2	1
0.15 1,814 lbs.	0.15 1,740 lbs.	0.33 1,320 lbs.	0.10 1,120 lbs.	0.10 800 lbs.	0.10 510 lbs.	0.10 550 lbs.	0.10 770 lbs.	0.10 1,040 lbs.

Manurial Scheme.

Plots—1, 5, 6 Bonemeal 1 md. and Cowdung 100 mds. per acre.
„ 2, 3, 4 Flour phosphate 1 md. and Cowdung 100 mds. per acre.
„ 8, 9 Cowdung 100 mds. per acre.
Plot—7 No Manure.

STATEMENT VIa.

N

MANURIAL EXPERIMENTS PLOT 1919-20.

Yield per acre of plots 1|12th acre each.

Crop:—KATAKTARA AUS PADDY.

11 432 lbs.	1 984 lbs.
12 1,032 lbs.	2 1,608 lbs.
13 792 lbs.	3 1,260 lbs.
14 720 lbs.	4 1,248 lbs.
15 948 lbs.	5 948 lbs.
16 1,356 lbs.	6 996 lbs.
17 1,272 lbs.	7 1,032 lbs.
18 1,260 lbs.	8 1,056 lbs.
19 1,536 lbs.	9 1,404 lbs.
20 1,020 lbs.	10 1,116 lbs.
a 1,488 lbs.	g 1,620 lbs.
b 1,584 lbs.	h 1,332 lbs.
c 1,104 lbs.	i 1,044 lbs.
d 1,512 lbs.	j 912 lbs.
e 1,332 lbs.	k 1,020 lbs.
f 1,584 lbs.	l 1,032 lbs.
o 1,152 lbs.	m 1,104 lbs.
p 1,440 lbs	n 1,080 lbs.

Manurial Scheme.

Plots.—4, 9, 12, 17, b, a, f, g, h, m, p.

Bonemeal at 480 lbs. per acre.

Ammonium Sulphate at 54 lbs. per acre.

Plots.—3, 7, 13, 18, a, c, j, k, n, o.

Rock Phosphate at 36 lbs. per acre,

Ammonium Sulphate at 154 lbs. per acre.

Plots.—1, 2, 5, 6, 8, 10, 11, 14, 15, 16, 19, 20, e, i, l.

Ammonium Sulphate at 154 lbs. per acre.

STATEMENT VIB.

MANURIAL EXPERIMENT, SOUTH MIRPUR PLOTS, 1919-20.

Crop:—KATAKTARA AUS PADDY.

Yield per acre of plots (area of each plot noted in the diagram).

1	2	3	4	5	6	7
0.20	0.20	0.10	0.20	0.20	0.10	0.20
200 lbs.	220 lbs.	310 lbs.	230 lbs.	350 lbs.	260 lbs.	280 lbs.

Manurial Scheme:

Plots 1 & 7—Bonemeal at 480 lbs. per acre.
Ammonium Sulphate at 54 lbs. per acre.
Plots 2, 4, 5—Rock Phosphate at 360 lbs. per acre.
Ammonium Sulphate at 154 lbs. per acre.
Plots 3 & 6—Ammonium Sulphate at 154 lbs. per acre.

N

MANURIAL EXPERIMENT, CENTRAL MIRPUR PLOTS, 1919-20.

RESIDUAL EFFECT OF MANURE ON JUTE FOR AUS PADDY.

Crop:—KATAKTARA AUS PADDY.

Yield per acre of plots 1/6th acre each.

N

1 1,668 lbs. Green Manure, Lime and Bonemeal.	9 1,593 lbs. Lime and Bonemeal.
2 1,839 lbs. Green Manure.	10 1,884 lbs. No Manure.
3 188 lbs. Green Manure, Lime and Bonemeal.	11 1,578 lbs. Lime and Bonemeal.
4 1,716 lbs. Green Manure.	12 1,658 lbs. No Manure.
5 1,668 lbs. Lime and Bonemeal.	13 1,416 lbs. Green Manure, Lime and Bonemeal.
6 1,644 lbs. No Manure.	14 2,052 lbs. Green Manure.
7 1,764 lbs. Lime and Bonemeal.	15 1,548 lbs. Green Manure, Lime and Bonemeal.
8 1,593 lbs. No Manure.	16 1,824 lbs. Green Manure.
17 1,716 lbs. No Manure.	18 1,584 lbs. No Manure.

STATEMENT VII.

MANURIAL EXPERIMENTS, EAST RAVINE, 1919-20.

Name of Manure.	Quantity applied per acre, in pounds.	Number of plots.	Area in acres.	Actual outturn in pounds.	Outturn per acre in pounds.
No Manure	....	1	.10	219	2,190
Steamed Bonemeal ..	240	3	.30	834	2,780
Unsteamed Bonemeal ..	250	2	.20	540	2,700
Shrimp Waste	300	2	.20	577	2,885
Mustard Cake	370	2	.20	470	2,350
I. O. P. Cake	300	2	.20	504	2,520

APPENDIX X.

REPORT OF THE CATTLE FARM, RANGPUR, FOR THE YEAR 1919-20.

1. Site Description and Area.—The Farm is situated on the eastern border of the town very close to the Railway Station; the railway line in fact passes through the Farm. The recent acquisition of a plot of land in order to get a bigger paddock and improve the front boundary has increased the area of the Farm from 332 acres to 333.4 acres.

Of these 333.4 acres 250 acres are high, 66 acres low and 17 acres Beel land and distributed as below:—

Cultivation	... 198	acres
Bamboo groves	... 2	,,
Road, drains, etc.	... 14	,,
Farm steading and paddocks	... 15.4	,,
Pastures, tanks, thatching grass and unreclaimed lands	104	,,
	333.4	acres

The soil of the Farm is a light sandy loam rather deficient in lime.

2. Laying out of Plots.—No attention was paid so long to this most important item perhaps for want of funds. It is high time that something is done, or it is waste of money to run such a concern.

In the absence of proper drainage even the high lands get waterlogged during heavy rains; the grazing area is reduced to practically nil. These conditions existing it would be a mistake to expect anything out of this place.

The problem of laying out of plots of the Farm is gradually progressing. The plots are being levelled drains, and roads are being made and high uncultivated lands are being reclaimed and made cultivable to grow fodder crops, *e.g.*, joar, maize, etc. Most of the ditches and small tanks are being filled up with earth.

3. Petty Repairs and Construction.—The old main road of the Farm has been remodelled and metalled. Two sheds have been erected to accommodate the cow-keepers who had practically no place to live in so long. To avoid swamping the yard have been levelled, pucca drains have been run around the cattle-sheds. Five pucca manure pits with corrugated iron roofs have been constructed; this will save the Farm a considerable waste of cow-dung and urine. For the total cost of the above constructions a sum of Rs. 9,900 was spent.

The offsprings by the Hisser bull seem to be quite promising and of uniform type with long pendulous ears, broad chest, docile habit, stout legs and mostly of grey colour. 58 offsprings (32 females and 26 males) of the above bull have been bred up this year.

4. Stock.—The following table will show the stock of the Farm up to the 31st March, 1920:—

Cows	Class 1 ...	...	48
Cows	Class 2 ...	...	43
			—
			91

Sucklings below one year—

Male	... 38
Female	... 42
	—
	80

Young stock one year and above—

Male	71	(Out of which 16 have been castrated)	
Female	41		
	—		112
Bull	4		4
Bullocks	60		60
			———
		Total ...	347

5. Yield of Milk.—The following table shows the average daily yield of milk per cow obtained after allowing the sucklings a full drink:—

April, 1919	... 2.38	lbs.
May, 1919	... 2.26	,,
June, 1919	... 2.32	,,
July, 1919	... 2.61	,,
August, 1919	... 2.01	,,
September, 1919	... 1.74	,,
October, 1919	... 2.01	,,
November, 1919	... 2.31	,,
December, 1919	... 2.29	,,
January, 1920	... 2.19	,,
February, 1920	... 2.39	,,
March, 1920	... 2.8	,,

6. Diseases and Casualties.—There was an outbreak of Rinderpest disease in the herd: but on account of timely detection and inoculation with Anti-Rinderpest serum the disease was checked. Only one heifer which was first attacked died.

The following are the casualties:—

Numbers.	Section.	Cause of Death.
3	Cows	Old age and debility.
1	Heifer	Rinderpest.
4	Calves	Premature labour and other diseases.
1	Bullock	Tympanitis.
—		
Total 9		

7. Climatic Condition.—The following table shows the rainfall statistics:—

Months.	Actual Rainfall.	Rainy Days.	Normal Rainfall.	Rainy Days.
1919.				
April	...	...	3.01	4.3
May	7.52	14	10.66	11.5
June	7.00	19	18.00	15.7
July	17.86	26	15.89	15
August ...	4.65	17	15.89	13.7
September ...	7.75	19	12.80	13.3
October ...	12.63	8	14.24	4.4
November ...	Nil	Nil	0.12	0.2
December ...	Nil	Nil	0.05	0.2
1920.				
January ...	Nil	Nil	0.50	0.9
February ...	0.63	3	0.54	1.2
March ...	1.28	4	1.25	1.8
Total ...	39.32	110	81.93	82.2

The season was not very favourable for Khariff crops. In the beginning of the Bhadoi season deficient rainfall delayed the sowing of Aus paddy and jute. Scarcity of water was also felt at the transplanting time of winter paddy. The Rabi season was favourable on the whole. The rainfall in February was quite welcome.

8. Crops.—The following crops were grown in the Farm in the year under report:—

(*a*) Fodder crops—the area and outturn under each of the above are given below:—

Name of the Crop.	Area in bigha.	Actual Outturn. Mds.	Sr.	Ch.	Remarks.
Jear ...	170.5	20,410	27	0	Green fodder fed to cattle.
Maize ...	64.25	4,071	21	0	Do.
Cowpea ...	87.00	3,904	0	0	Do.
Do.	6.0	15	20	0	Seeds for growing next year crop.
Kalai ...	21.17	10	0	0	15 Bighas have been grazed by the cattle.

Several varieties of the fodder crop were tested. The results of the experiments are stated below:—

9. Experiments—(a) Fodder.—The results of the experiments regarding the varietal test of different kinds of fodder crop.

Manure applied—200 mds. of cowdung per acre.

Name of variety.	No. of plots of 1/20th acre each.	Outturn actual.	Average Outturn.	
			Actual.	Per acre.
		Mds. Srs.	Mds. Srs.	
Sundhia Joar ...	2	39½ 0	19¾ 0	395
Yellow Maize ...	2	21 14	10 27	213
Paris Joar ...	2	37 35	18 37	378½
Umbercane Joar ...	2	18 30	9 15	187½
Fulgar ,, ...	2	37 35	18 37	387½
Local ,, ...	2	30 20	15 10	305
Dukhary ,, ...	2	28 24	14 12	286
Cowpea ,, ...	2	32 0	16 0	320

The fulgar joar was found to be better resistant from the attack of the disease "the reddening of joar" than the other varieties; but as regards the yield Sundhia variety beat all others.

(*b*) *Jute.*—About one acre of land was grown under the Fibre Expert's jute D.136 for seed production and in another acre of land varieties of jute were tested. The following varieties were tested to find out a standard:—R.85, R.63, D.154, Kakya bombai, Dacca green olitorius, Keraniganj and Fandock. R.85 and D.154 competed each other. On the average the latter gave an increased outturn of 1½ mds. per acre.

(*c*) *Kataktara Aus Paddy.*—Economic Botanist's Kataktara Aus paddy was sown on 4.33 acres of land producing 29 mds. 21 srs. of pure seeds. The outturn was very poor owing to the bad climatic condition.

(*d*) *Indrasail Winter Paddy.*—The Economic Botanist's Indrasail Dacca No. 1 was grown on 32 acres of low land for pure seed production, which gave an outturn of 502 mds. 35 srs. 8 ch. This whole quantity of seed was given for demonstration work. Some other varieties of paddy, *e.g.*, Katari-bhog, Bhabanibhog, Betho and Jasoa were also grown in the low land. Two sets of experiments outlined by the Economic Botanist were also tried. In one set Indrasail was tried against two of the local variety—Jasoa and Panisail—and in another it was tried against Jasoa and Syamras.

In the first set Indrasail gave an average increased outturn of 2½ mds. per acre over Panisail and 2 mds. over Jasoa.

In the second set Syamras brought an average increase of 10 seers per acre over Indrasail but Jasoa was defeated by Indrasail by 32½ seers per acre on the average.

(*e*) *Flax.*—It was sown on 8.33 acres of high land for propagation of seeds.

Silo and Silage.—To supplement the fodder supply in December and January when it generally falls short, green maize and joar were preserved in the pucca Silo. Six katcha Silos were also made to preserve green fodder. The cattle consumed this stuff with great relish.

10. Practical Training in Agriculture.—18 young men were taken for practical training in Agriculture; out of these two got appointments as demonstrators after the completion of their training.

THE FINANCIAL STATEMENT OF THE RANGPUR CATTLE FARM FOR THE YEAR 1919-20.

RECEIPTS.

	Rs.	As.	P.
Amount credited into treasury ...	4,256	13	0
Stock in hand on the 1st April, 1920 ...	1,434	4	9
Bills outstanding for Farm produce of 1919-20 ...	2,161	0	0
Total ...	7,852	1	9
Deduct the value of previous year's Farm produce realised during this year ...	225	3	0
Total ...	7,626	14	9
Bills outstanding for previous year's Farm produce ...	1,553	6	9
Grand total ...	9,180	5	6

EXPENDITURES.

	Rs.	As.	P.
Establishment ...	3,446	9	6
RECURRING EXPENDITURE—			
Purchase and feed of cattle ...	9,659	10	6
Purchase of seeds, manures and implements ...	1,796	14	0
Wages of Farm labourers ...	11,620	12	0
Cost of training the apprentices ...	1,065	4	0
Laying-out and maintenance ...	1,199	4	9
Petty construction and repairs ...	10,705	6	3
Service postage and telegram charges	100	0	0
Purchase of furniture	150	0	0
Office expenses and miscellaneous ...	2,226	15	9
Total ...	38,524	3	3
Grand total ...	41,970	12	9

11. Inspection.—In this year under report the Farm was visited by the Hon'ble Sir Henry Wheeler, K.C.I.E., C.S.I., I.C.S., Member of the Council. Mr. D. H. Lees, I.C.S., Commissioner of the Rajshahi Division, visited the Farm twice with the Collector of the District. The Farm was also once visited by the Imperial Mycologist, several times by the Director of Agriculture and frequently by the Deputy Director of Agriculture.

12. Staff.—Babu Suresh Chandra Chakraverty, B.Sc., L.Ag., was in charge of the Farm till the 31st May, 1919, when Babu Atal Behari Sen, B.Ag., was appointed—Suresh Babu taking up appointment under the Economic Botanist. The other officers in the staff consists of two Assistant Superintendents, two Overseers and a fieldman clerk.

R. DAS GUPTA,
Deputy Director of Agriculture, Northern Circle.

APPENDIX XI.

REPORT OF THE RANGPUR DEMONSTRATION FARM FOR THE YEAR 1919-20.

1. Introductory.—The Farm is situated in the heart of the town of Rangpur. It was started in 1905 by the Rangpur Agricultural Association with the object of conducting experiments on Agriculture. In 1911 it was made over to this Department and is being used since for comparative trials with experts' seeds and best varieties of local crops for multiplication of experts' seeds for distribution among the cultivators of the district.

2. Area.—The Farm has an area of 19.16 acres under cultivation, the rest being occupied by roads, drains, pathways and buildings, etc. The following are the buildings and sheds on the place:—

(1) Office and Godown.

(2) Quarters of the Superintendent.

(3) Quarters of the Overseer.

(4) Open sheds for implements.

(5) Cattle-shed.

(6) Manure-shed.

3. Soil.—The soil is a rich moist loam of light texture. The sub-soil after a depth of about 3 feet is almost pure sand.

4. Rainfall and Character of the Season.—The rainfall during the year under report was as follows:—

Months.	Actual rainfall.		Normal rainfall.	
	Amount of rainfall.	No. of rainy days.	Amount of rainfall.	No. of rainy days.
1919.	Inches.		Inches.	
April	...	...	3.01	4.3
May	7.52	14	10.66	11.5
June	17.01	19	18.00	15.7
July	17.86	26	15.89	15.0
August	4.65	17	12.80	13.7
September ...	7.75	19	14.24	13.3
October ...	12.63	8	4.87	4.4
November ...	...	...	0.12	0.2
December ...	...	...	0.05	0.2
1920.				
January	...	...	0.50	0.9
February ...	0.63	3	0.54	1.2
March	1.28	4	1.25	1.8
Total ...	69.33	110	81.93	82.2

It is evident from the above figures that the weather was not very favourable during the year. On account of dearth of rainfall in March and April the sowing of jute and Aus paddy was much delayed and the shortage of rainfall in August and September caused much damage to the winter paddy. The rainfall in February and March, though rather scanty, benefitted the Rabi crops to a great extent.

5. Operations.—The works may be divided into experimental and non-experimental:—

1. Experimental—

(*a*) Varietal test—Aus paddy (Kataktara *vs.* Local).
(*b*) Ditto Winter paddy (Indrasail *vs.* Local).
(*c*) Ditto Jute (Kakya bombai *vs.* other varieties).

2. Non-experimental—

(*a*) Sugarcane.
(*b*) Potato.
(*c*) Wheat.
(*d*) Jowar.
(*e*) Oats and Peas.

(*1*) *Aus Paddy* (*Oryza Sativa*).—In order to show the superiority of Kataktara a varietal experiment was arranged. Two varieties of local Aus paddy were grown against Kataktara in 1/20th acre plots. Sixteen such plots were sown with Kataktara, 8 each with Chapalo and Sonamail (2 of the best local Aus). The table below will show that Kataktara gave an increased outturn of 1 maund 20 seers over Sonamail and 5 maunds 25 seers over Chapalo per acre.

Name of paddy.	No. of plots of 1/20th acre each.	Actual outturn.	Average actual.	Outturn per acre.
		md. s. ch.	md. s. ch.	md. s. ch.
Kataktara ...	16	17 4 12	1 2 12	21 15 0
Sonamail ...	8	7 37 13	0 39 12	19 35 0
Chapalo ...	8	6 11 12	0 31 8	15 30 0

(*2*) *Winter Paddy.*—Dacca No. 1 Indrasail was transplanted on standard plots, 1/10th acre, as well as on non-standard plots. The result is tabulated below:—

No. of block.	Name of paddy.	Area in acres.	Actual Outturn.		Outturn per acre.	
			lbs.	md. s. ch.	lbs.	md. s. ch.
3	Indrasail paddy	1.60	1,741	21 30 12	1,088	13 24 0
3x	Do. ...	.58	1,528	19 4 0	2,619	32 29 18
4	Do. ...	.80	1,309	16 14 12	1,636	20 18 0
5	Do. ...	1.50	1,741	21 30 8	1,161	14 20 8
6	Do. ...	.20	164	2 2 4	820	10 10 0
6x	Do. ...	.20	370	4 25 0	1,850	23 5 0
7	Do. ...	1.05	1,054	13 7 0	1,004	12 22 0
7x	Do. ...	.20	260	3 10 0	1,300	16 10 0
10	Bhabani bhog ...	.50	259	3 9 8	518	6 19 0*
11	Indrasail ...	.25	23	0 11 8	92	1 6 0†
12	Bhabani bhog ...	.75	431	5 15 12	575	7 7 8

* Transplanted.
† Broadcast.

Economic Botanist tried Dacca No. 1 Indrasail paddy against local Joshoa paddy in 6 plots of 1/20th acre each. Seedlings were transplanted 9 inches apart both ways. Indrasail gave an average increase of 1 maund $3\frac{3}{4}$ seers over Joshoa paddy per acre. The result is tabulated below:—

Name of paddy.	No. of plots of 1/20th acre each.	Actual outturn.	Average outturn one plot.	Difference.
		md. s. ch.	md. s. ch.	md. s. ch.
Indrasail ...	6	4 30 12	0 31 12	0 2 3 *i.e.*, 1 md. $3\frac{3}{4}$ seers per acre.
Joshoa ...	6	4 16 8	0 29 9	

(3) *Jute* (*Corchorus Capsularis*).—Kakya bombai jute was tried with local early variety. The result will show that though the crop was out at an early stage to avoid water-logging, Kakya bombai gave an increased outturn of about 11 seers, *i.e.*, $2\frac{3}{4}$ maunds per acre.

No. of sub-plots.	Name of jute.	Area in acres.	Actual Outturn.		Outturn per acre.	
			lbs.	md. s. ch.	lbs.	md. s. ch.
1	Kakya bombai	1/10	$184\frac{1}{2}$	2 12 4	1,845	23 2 8
2	Local ...	1/10	$171\frac{1}{2}$	2 5 12	1,715	21 17 8
3	Kakya bombai	1/10	150	1 35 0	1,500	18 30 0
4	Local ...	1/10	$119\frac{1}{2}$	1 19 12	1,195	14 37 8

(b) *Varietal Test of Jute.*—Kakya bombai was tried against Dacca Bas, R.85 Simulkandi and Local Hewti. It will be seen from the table below that R.85 gave a better outturn than the others.

No. of sub-plots.	Variety.	Area in acres.	Actual Outturn.		Outturn per acre.	
			lbs.	md. s. ch.	lbs.	md. s. ch.
1	Kakya bombai	1/10	227	2 33 8	2,270	28 15 0
2	R.85 ...	1/10	241	3 0 8	2,410	30 5 0
3	Kakya bombai	1/10	216	2 28 0	2,160	27 0 0
4	Dacca Bas ...	1/10	184	2 12 0	1,840	23 0 0
5	Kakya bombai	1/10	$228\frac{1}{2}$	2 34 4	2,285	28 22 8
6	Simulkandi ...	1/10	$134\frac{1}{2}$	1 27 4	1,345	16 32 8
7	Kakya bombai	1/10	226	2 33 0	2,260	28 10 0
8	Local Hewti ...	1/10	160	2 0 0	1,600	20 0 0
9	Kakya bombai	1/10	246	3 3 0	2,460	30 30 0

(4) *Sugarcane* (*Saccarum Officinarum*).—Sugarcane was grown on one acre and gave an outturn of 26 maunds 15¼ seers of Gur and 7,000 cuttings.

(5) *Potato* (*Solanum Tubersum*).—Three varieties of potato were tried. The result was not satisfactory owing to the crop being affected with Rhizactonia.

(6) *Wheat* (*Triticum Sativum*).—Two varieties of wheat, Pusa 12 and Gangajali, were grown in 1.46 acres. The result is tabulated below:—

Name of wheat.	Area in acre.	Actual Outturn. md. s. ch.	Outturn per acre. md. s. ch.
1. Gangajali ...	23/30	7 35 0	10 11 0
2. Pusa ...	1/2	4 10 0	8 20 0

Other Crops.—Jowar (Sorghum Vulgare).—On blocks Nos. 6y, 8x, and 9 Jowar was grown on 0.93 acre in 3 plots and was fed to cattle in green condition.

Oats and Peas (Avene Sativa and Pisum Arvonse) were grown on 0.66 acre in block No. 4x and fed to cattle in green condition.

4. Seed Distribution.—Fourteen maunds of Kataktara and 80 maunds of Indrasail paddy were made over to the Superintendent of Agriculture, Rajshahi Division, for distribution: 4,550 sugarcane cuttings have been sold.

5. Training of Students.—Four men were trained in practical agriculture in this Farm during the year under review; 2 men sent by the District Board, Noakhali, joined the Farm on 1st of February, 1920, to learn the cultivation of sugarcane and gur-making.

6. Inspection.—The Director of Agriculture and the Deputy Director of Agriculture visited the Farm several times. The Farm was also visited by the Economic Botanist to the Government of Bengal, and the Imperial Mycologist, Pusa, once, and twice by the Collector of Rangpur.

7. Establishment.—Babu Mohini Mohan Ghosh, the District Agricultural Officer, Rangpur, was in charge of the Farm who was assisted by the Overseer, Babu Prafulla Ranjan Sen Gupta, during the year.

FINANCIAL STATEMENT OF THE RANGPUR DEMONSTRATION FARM FOR THE YEAR 1919-20.

RECEIPTS.

	Rs.	As.	P.
Amount credited into Treasury ...	1,920	3	9
Stock in hand on 1st April, 1920 ...	130	14	0
Bills outstanding for Farm produce of 1919-20	11	9	9
Total Rs. ...	2,062	11	6
Deduct value of previous year's Farm produce sold and realized during the year ...	737	3	0
	1,325	8	6
Bills outstanding for previous year's Farm produce ...	241	8	6
Grand Total ...	1,567	1	0

EXPENDITURE.

	Rs.	As.	P.
Establishment ...	570	3	0
Contingencies—			
Purchase and feed of cattle ...	350	0	0
Purchase of seeds, manures and implements ...	300	0	0
Wages of labourers for cultivation ...	1,421	1	3
Reclamation ...	1,257	0	0
Wages of men undergoing training ...	203	14	9
Petty construction and repairs ...	1,500	0	0
Railway and steamer freight ...	10	12	0
Service postage stamps	15	0	0
Rents and taxes ...	82	6	0
Office expenses and Miscellaneous ...	150	0	0
Total Rs. ...	5,290	2	0
Value of stock held over from previous year ...	75	0	6
Total Rs. ...	5,365	2	6
Grand Total Rs. ...	5,935	5	6

APPENDIX XII.

REPORT OF THE BURIRHAT FARM FOR THE YEAR 1919-20.

I. INTRODUCTORY.—The Burirhat Farm, which is mainly intended for tobacco experiments, was established in the year 1907, though the actual works did not commence until August, 1908. The experimental works in relation to the suitability of different varieties of tobacco, both local and exotic, for cigarette and cigars were regularly conducted. The total area of the Farm is 52 acres, of which 38 acres are under cultivation. Even here no proper laying out was ever done. There were no roads. The plots were very irregular and of ununiform levels. The defects and drawbacks were explained to Mr. Milligan and with his approval the Farm has been laid out into plots of uniform size with proper levels. Roads have been opened so that carts might reach every plot and drains have been dug to drain off excess water. This has reduced the cultivated area from 38 acres to about 30 acres but there will be some more lands reclaimed.

II. SOIL.—The soil of the Farm is a sandy loam with a sub-soil of pure sand rather deficient in lime. The soil although originally very poor has greatly been improved by systematic cultivation and proper manuring.

In the year under report a pucca cattle-shed and a manure-pit have been erected at a cost of Rs. 2,740.

SEASON.—The season on the whole was not favourable for tobacco. From the table of rainfall given it will be seen that the rainfall in the months of August and September, 1919, was below the normal and that in the month of October it was far above the normal with 10 inches of rainfall in one day, *viz.*, the 4th October, 1919. The heavy shower suddenly over-flooded the whole tobacco-growing region and destroyed most of the seedlings that were on progress on the seed-bed and spoiled the tilth of the soil of the tobacco lands that were under preparation rendering the soil too moist for early transplantations. To add to this trouble on account of over-flooding and late sowing the crops on the field later on suffered seriously from the attack of a kind of surface caterpillar, generally called cut-worm (Agrotipsyp silon). The cloudy weather during the months of February and March deteriorated the qualities of the tobacco so far as their strength and gumminess are concerned, and the absence of a warm westerly breeze, which is essential for the successful curing of tobacco, has caused a deterioration in the colour of such leaves.

Table showing the rainfall during the year.

Months.	Actual Rainfall.		Normal Rainfall.	
	Rainfall in inches.	No. of Rainy Days.	Rainfall in inches.	No. of Rainy Days.
1919.				
April	.99	3	3.01	4.3
May	9.14	11	10.66	11.5
June	22.70	14	18.00	15.0
July	27.68	28	15.89	15.0
August	9.03	13	12.80	13.7
September	10.28	20	14.24	13.3
October	17.30	7	4.87	4.4
November	Nil	Nil	0.12	0.2
December	Nil	Nil	0.05	0.2
1920.				
January	Nil	Nil	0.05	0.9
February	0.92	4	0.54	1.2
March	0.50	1	1.25	1.8

III. Operations—

Crops—

(i) Bhadai— Acres.

(a) Cowpea for green-manuring tobacco .. 20.0
(b) Joar for fodder 2.0
(c) Aus paddy 11.3
(d) Sunn hemp for green-manuring 2.0

(ii) Rabi—

(a) Tobacco (Nicotina tobaccum and Nicotina Rusting).

Local— Acres.

(1) Bhengi 3.5
(2) Hamaku 4.0

Exotic—

(1) Sumatra (for cigar wrapper) 4.0
(2) American cigarette tobacco 6

1. White Barley.
2. Yellow prior.
3. Orinoco.

(iii) Turkish 3

Cavalla.
Ayasanlauk.

(iv) Varieties from different districts .. .. .16
Lentils 2.0
Oats and peas 15.6

30.16

IV. Experiments—

(1) Improvement of Sumatra tobacco for cigar wrapper.

(2) Trial of American and Turkish varieties tobacco for cigarette manufacture.

(3) Comparison of different varieties of tobacco generally grown in the province.

(4) Improvement of local varieties by selection.

(5) Manurial requirements for tobacco.

(6) Trial of Economic Botanist's selected *Kataktara Aus* paddy against the best local *Aus* varieties.

Sumatra tobacco.—The reputation of the Sumatra tobacco grown from the carefully selected seeds of the Burirhat Farm for cigar wrapper has now been established in the market though the price has fallen from the previous two years. This year a crop of 2,600 lbs. of Sumatra leaves has been obtained from an area of 4 acres and offers varying from Re. 1 to Rs. 1-6 per lb. have been received. The cultivators are also taking up its cultivation largely.

Cigarette tobacco.—The experiment with American and Turkish varieties of cigarette tobacco has been continued and by proper selection of seeds and systematic cultivation and manuring this year we succeeded in growing the types of leaves the quality of which was as desired by the cigarette-manufacturing companies. This year we grew 2 maunds 15 seers of American and 1 maund 20 seers of Turkish tobacco which were sold at -|12|- (annas twelve) and Re. 1|- (Rupee one) per lb. respectively. The company which purchased this year's crop was ready to make previous contract for 200 maunds of American and 300 maunds of Turkish tobacco if it might be supplied from the next year's crop. One of the drawback of the sale of cigarette tobacco is that the Companies have no attraction for smaller quantities. Consequently, if cultivated in a larger scale, this tobacco may be expected to become one of the most paying crops for the district of Rangpur.

Rangpur vs. other varieties from different districts.—The comparison is being carried on for the last 4 years and the superiority of the Rangpur varieties to other district varieties was decidedly manifested.

Manurial requirements for tobacco.—The value of green-manuring with cowpea has been thoroughly established. The last year's experiment of green-manur-

ing with sunn hemp as compared with 100 maunds and 200 maunds of cowdung per acre in the cultivation of local Bhengi tobacco with some addition has this year also been continued.

The experiment, as planned out, is given below.

TOBACCO—BHENGI. *Previous Crop—Aus paddy followed by Lentils ; Area—1|20th of an acre each plot.*

Plot No.	Nature of operation.	Actual outturn. (Green.)			Outturn per acre. (Green.)			Plot No.	Nature of operation.	Actual outturn. (Green.)			Outturn per acre. (Green.)		
		Mds.	s.	ch.	Mds.	s.	ch.			Mds.	s.	ch.	Mds.	s.	ch.
1.	Green-manuring with sunn hemp ..	4	15	0	87	20	0	11.	200 mds. cowdung per acre	1	19	0	29	10	0
2.	Green-manuring with cowpea	3	36	0	78	0	0	12.	100 mds. cowdung per acre	1	14	0	27	0	0
3.	100 mds. cowdung per acre	2	37	0	58	20	0	13.	Cowdung 100 mds. per acre	1	21	0	30	20	0
4.	Cowpea and 75 mds. cowdung per acre ..	4	21	0	90	20	0	14.	Cowdung 150 mds. per acre	1	30	8	35	10	0
5.	Cowpea and super-phosphate 30 seers per acre	4	32	8	96	10	0	15.	Cowpea and super-phosphate	2	18	8	54	10	0
6.	Cowpea rotted in pits ..	3	25	4	72	25	0	16.	Cowpea cut green and rotted in pits ..	2	18	8	49	10	0
7.	100 mds. cowdung per acre	2	11	8	45	30	0	17.	100 mds. cowdung per acre	2	20	0	50	0	0
8.	150 mds. cowdung per acre	2	7	0	43	20	0	18.	Cowpea and 75 mds. cowdung per acre ..	1	35	8	37	30	0
9.	200 mds. cowdung per acre	2	23	4	51	25	0	19.	Green-manuring with sunn hemp ..	1	28	0	34	0	0
10.	100 mds. cowdung per acre	2	17	0	48	20	0	20.	Green-manuring with cowpea	1	17	8	28	30	0

An experiment of green-manuring with sunn hemp cut green and rotted in the pits as compared with 200 maunds of cowdung and 100 maunds of cowdung with various quantities of oil-cake in the cultivation of local Bhengi tobacco failed on account of the serious attack of a kind of surface caterpillar (Agrotipsyp silon).

The effect of top-dressing with saltpetre 1 maund per acre in addition to usual quantity of cowdung manure in the cultivation of Sumatra tobacco is also being experimented.

Economic Botanist's selected seeds of *Kataktara Aus* paddy tried against the best local varieties of Aus paddy, Garia and Chapla, gave the following results :—

CROP—AUS PADDY. *Previous Crop—Cowpea followed by Tobacco; Area—1|20th of an acre each plot.*

Plot No.	Name of the variety.	Actual outturn.			Remarks.	Plot No.	Name of the variety.	Actual outturn.			Remarks.
		Mds.	s.	ch.				Mds.	s.	ch.	
1.	Kataktara	0	26	0		2.	Chapla	0	24	8	
3.	Do.	0	25	0	Outturn per acre 12 mds. 38 seers. Increase per acre 2 mds. 8 seers.	4.	Do.	0	22	8	Outturn per acre 10 mds. 30 seers.
5.	Do.	0	29	8		6.	Do.	0	22	8	
7.	Do.	0	29	8		8.	Do.	0	22	0	
9.	Do.	0	19	8		10.	Do.	0	16	0	
	Total	3	9	8			Total	2	27	8	
11.	Kataktara	0	14	0		12.	Garia	0	11	8	
13.	Do.	0	18	8	Outturn per acre 9 mds. 20 seers. Increase per acre 3 mds. 4 seers.	14.	Do.	0	12	0	
15.	Do.	0	18	8		16.	Do.	0	15	0	Outturn per acre 6 mds. 16 seers.
17.	Do.	0	19	8		18.	Do.	0	12	0	
19.	Do.	0	24	8		20.	Do.	0	13	8	
	Total	2	15	0			Total	1	24	0	

DISTRIBUTION OF SEEDS.—The demand for the selected superior seeds of Sumatra and other local varieties of tobacco from the Burirhat Farm has greatly increased as will be shown by the list of seed distribution given below:—

Name of the variety.	Quantity	Distributed
	lbs.	ozs.
Sumatra	3	3
Matihari	4	0
Bhengi	3	11
Turkish tobacco seed	0	9
White Barley	0	5
Naokhol	0	4

Besides this, an automatic expansion from the seeds distributed last year has taken place with the result that in spite of the unfavourable season which the cultivators had to face this year, a small plot of Sumatra or other superior varieties of tobacco recommended by Burirhat Farm is to be found attached to nearly every holding round about Burirhat or other demonstration centres in the district of Rangpur.

V. MISCELLANEOUS.—*Cattle.*—We have at present 19 plough bullocks in the Farm including one pair we have purchased this year at a cost of Rs. 228.

PRACTICAL TRAINING IN AGRICULTURE.—This Farm has attracted much attention to the general public and this year we have got several letters from a number of public bodies for sending their nominees or stipend-holders for training in this Farm, but on account of the want of accommodation we could not take all of them.

The following list will show the details of apprentices that are under practical training in Agriculture and cigar manufacture in the Farm :—

(1) Apprentices under training in general agriculture paid by the Farm	5
(2) Apprentices under training in the manufacture of cigars and paid by the Farms	7
(3) Stipend-holders from the Noakhali District Board	2
(4) Stipend-holders from the Naogaon Ganja Society	3
(5) Private gentlemen for learning tobacco works	1

CONSTRUCTION AND LAYING OUT.—As already mentioned, one pucca cattle-shed and manure-pit have this year been erected at a cost of Rs. 2,740 and Rs. 2,500 have been spent in relaying out the Farm with levelling and drainage.

MANUFACTURE OF CHEROOTS.—The demand for Burirhat cigars has outreached the supply and the quality of the cigars has gradually been improving with experience. Two of the apprentices taken for learning the art of cigar-making in the last year have proved themselves to be very good workers and are expected to become fit for taking up the work independently after a little further training. Our Cigar-roller visited with his appliances Exhibitions in Calcutta (Peace Celebration Exhibition), Burdwan, Suri and Banjetia and demonstrated the cigar manufacture.

IMPLEMENTS.—As in previous years the Spring Tooth Harrow and Planet Junior Hand Hoe have been found to be very useful.

VISIT AND INSPECTION.—The Farm was once inspected by the Hon'ble Sir Henry Wheeler, the Finance Member to the Government of Bengal, once by the Director of Agriculture, Bengal, twice by the Commissioner, Rajshahi Division, thrice by the District Collector of Rangpur and several times by the Deputy Director of Agriculture, Northern Circle, Bengal.

ESTABLISHMENT.—Babu Kamini Kumar Lahiry, B.Ag., was the Farm Superintendent throughout the year. He was assisted by one overseer, one fieldman clerk and a tobacco-curer.

The Statement showing the receipt and expenditure of the Burirhat Farm, Rangpur, during the year 1919-20.

RECEIPTS.

	Amount credited into the treasury and book transferred.	Amount outstanding.
	Rs. As. P.	Rs. As. P.
Sale of cigars	791 5 0	226 3 0
Sale of Joar seeds	1 2 0	.....
Sale of cigarette tobacco	262 8 0	.....
Sale of Aus paddy	447 9 9	3 12 0
Sale of local tobacco	1,134 12 0	.....
Sale of oats	16 0 0	.....
Sale of potato	40 8 0	0 12 0
Sale of Bispat tobacco	89 0 0	.....
Sale of tobacco seeds	60 12 0	40 0 0
Sale of cowpea seeds	3 8 0	.....
Sale of lentils	14 8 0	.....
Sale of Sumatra tobacco	1,024 2 0	.....
	3,885 10 9	270 11 0
	270 11 0	
	4,156 5 9	
Value of the stock in hand	2,324 0 0	
Total Rs. ..	6,480 5 9	

EXPENDITURE.

	Rs. As. P.
Purchase and feed of cattle	720 5 9
Purchase of seed, manure and implement	488 7 6
Wages of farm labourers including Rs. 758-2-3 spent for training apprentices	3,861 3 9
Railway and steamer freight	29 10 0
Service postage stamps	80 4 0
Cost of medical aid	70 1 0
Office and miscellaneous expenses	790 0 0
	6,040 0 0
Petty construction and repairs (including the construction of a cattle-shed and a manure-pit and relaying out of the Farm)	6,840 0 0
Total Rs. ..	12,880 0 0

R. DAS GUPTA,
Deputy Director of Agriculture,
Northern Circle, Rangpur.

APPENDIX XIII.

ANNUAL REPORT OF THE RAJSHAHI FARM FOR THE YEAR 1919-20.

Introductory.—In 1901 the District Association of Rajshahi got possession of this site to start an agricultural farm. In 1904 they made it over to the Government. It was started in July 1904.

The farm was originally started to serve as an experimental station for the whole Rajshahi Division.

It is situated on the border of the town of Rampur-Boalia, the headquarters of the district, and covers an area of 63 acres, of which 50 acres are under cultivation, the rest being occupied by buildings, roads, tanks, etc.

The farm is divided into four rectangular blocks. There is one road, encircling the farm along its boundary, and two diametrical cross roads right through. A new road has also been constructed this year across the paddy fields.

About a third of the farm area is comprised of low lands and the remainder of high lands. The testing of experimental plots for uniformity and the laying out more standard plots were continued.

The soil of the farm contains a high percentage of lime, but is poor in potash, phosphoric acid and organic matter.

In 1907 an analysis of the soil was made by Dr. Leather. The results showing the composition is given below :—

Silica	77·90
Ferric acid	4·56
Alumina	6·15
Lime	3·29
Magnesia	0·65
Soda	0·21
Phosphoric acid	0·11
Sulphuric „	0·03
Carbonic „	2·34
Organic and combined matter	3·39

2. *Rainfall and Season.*—The following figures show the rainfall during the year :—

Month and year.	Actuals.		Normal.	
	Rainfall in inches.	Number of rainy days.	Rainfall in inches.	Number of rainy days.
February 1919	0·32	1	0·84	1·30
March „	Nil	Nil	1·15	1·60
April „	0·38	2	1·81	2·90
May „	2·32	10	5·56	7·70
June „	8·30	16	10·81	12·60
July „	13·26	17	11·45	15·10
August „	12·82	23	10·75	14·70
September „	13·31	14	10·40	12·40
October „ ...	2·85	5	4·46	4·90
November „	0·42	1	0·31	0·60
December „	Nil	Nil	0·06	0·20
January „	Nil	Nil	0·34	0·80

The table shows that the year was deficient.

That the rainfall was lower than the normal by 3·6 inches. Rains in April and May were little and sowing of the *bhadoi* crops was therefore delayed till the early part of June. The season was favourable since that time.

3. Operations during the year—

Varietal test with—

(*a*) Sugarcane (*Sacchurum officinarum*) Ratoon *vs.* plant.
(*b*) Jute (*Corchorous Olitorius*).
(*c*) Aus paddy (*Oriza Sativa*).
(*d*) Aman paddy (*Oriza Sativa*).

Manurial test with—

(*a*) Jute (*Corchorous Olitorius*).

4. Distribution of seeds.
5. Miscellaneous—
   (*i*) Cattle.
   (*ii*) Poultry.
   (*iii*) Practical training in agriculture.
   (*iv*) Visits and inspection.
6. Establishment.
7. Receipts and expenditure.

1. Varietal test with—

(*a*) *Sugarcane.*—In August and September there was some water-logging in the plots. The water level adjoining the Farm rose higher than the Farm level, the Farm sluices could not be opened to let out the water and the water had to be bailed out by means of dons. The growth of the canes was consequently affected to some extent.

The following table will show the comparative yield of ratoon and plant canes of the different varieties :—

RATOON.

Area.	Variety.	Weight of cane.	Weight of juice.	Weight of *gur*.	Yield of *gur* per acre.	Remarks.
		Mds. sr. ch.	Mds. sr. ch.	Mds. sr. ch.	Mds. sr. ch.	
$\frac{1}{10}$ acre	Yellow Tanna ...	43 16 12	29 20 10	5 15 6	53 33 12 or 4,414 lbs.	
Do ...	Striped Tanna ...	37 37 0	25 15 12	4 9 4	42 12 8 or 3,469 lbs.	
Do ...	Vendamukhi ...	31 24 12	19 37 4	3 12 1	33 0 10 or 2,707 lbs.	
Do ...	Gendari ...	43 32 10	30 3 4	5 7 13	51 38 2 or 4,260 lbs.	
Do ...	B 3412 ...	27 18 8	15 5 6	2 35 15	29 39 6 or 2,418 lbs.	
Do ...	B 147 ...	39 11 4	26 23 9	4 16 8	44 5 0 or 3,609 lbs.	
Do ...	Khagri ...	45 39 4	27 31 9	4 9 4	42 17 8 or 3,479 lbs.	

PLANT CANES.

Area.	Variety.	Weight of cane	Weight of juice.	Weight of *gur*.	Yield of *gur* per acre.	Remarks.
		Mds. sr. ch.	Mds. sr. ch.	Mds. sr. ch.	Mds. sr. ch.	
$\frac{1}{10}$ acre	Yellow Tanna ...	69 9 3	48 20 9	7 5 7	71 11 6 or 5,845 lbs.	Three top cuttings were taken from each cane.
Do ...	Striped Tanna ...	84 15 12	57 11 7	9 29 14	97 18 12 or 7,992 lbs.	One top cutting was taken from each cane.
Do ...	Vendamukhi ...	37 9 6	25 25 4	5 5 14	51 18 12 or 4,220 lbs.	Three top cuttings.
Do ...	Gendari ...	31 1 2	21 26 3	4 16 13	44 8 12 or 3,625 lbs.	
Do ...	B 3412 ...	58 5 3	39 33 2	7 18 16	74 23 12 or 6,118 lbs.	Three top cuttings were taken from each cane.
Do ...	B 147 ...	37 0 7	20 17 9	4 22 6	45 23 12 or 3,738 lbs.	
Do ...	Khagri ...	78 20 7	49 10 10	6 28 12	67 1 8 or 1,879 lbs.	

The general yield is not satistactory. The crop greatly suffered from drought between January and April.
The crop was therefore much thin. As in other years, the soft varieties were greatly damaged by jackals.

1(*b*). *Jute.*—The following four varieties of Olitorious were tested in duplicate blocks, viz., Dacca green, R. 26, R. 30 and R. 62. The sowing could not be commenced earlier than the first week of June for want of a good shower, a fact which affected the crop, ultimately. Dacca green has given the highest yield this year too as in the last two years. The results are given below :—

Block A. 36.

Plot No.	Area.	Varieties.	Actual green weight.	Actual weight of fibre.	Outturn of fibre per acre.	Remarks.
	Acre.		Mds. sr. ch.	Md. sr. ch.	Mds. sr. ch.	
1	1-20th	Dacca green ...	17 23 9 or 1,442 lbs.	1 0 0 or 82 lbs.	20 0 0 or 1,640 lbs.	
2	Do. ..	Ditto ...	16 35 8 or 1,384 lbs.	0 38 12 or 79 lbs.	19 15 0 or 1,588 lbs.	
3	Do. ...	R. 30 ...	14 4 0 or 1,156 lbs.	0 25 11 or 52 lbs.	12 33 12 or 1,053 lbs.	
4	Do. ...	Dacca green ...	14 38 8 or 1,226 lbs.	0 36 7 or 74 lbs.	18 8 12 or 1,493 lbs.	
5	Do. ...	R. 26 ...	15 26 0 or 1,283 lbs.	0 29 2 or 59 lbs.	14 22 8 or 1,194 lbs.	
6	Do. ...	Dacca green ...	16 3 0 or 1,318 lbs	1 2 14 or 87 lbs.	21 7 8 or 1,757 lbs.	
7	Do. ...	Ditto ...	18 7 8 or 1,491 lbs.	1 2 10 or 87 lbs.	21 12 8 or 1,747 lbs.	
8	Do. ...	Ditto ...	17 21 1 or 1,437 lbs.	0 37 8 or 76 lbs	18 30 0 or 1,537 lbs.	
9	Do. ...	R. 62 ...	16 15 6 or 1,343 lbs.	0 26 10 or 54 lbs.	13 12 8 or 1,091 lbs.	
10	Do. ...	Dacca green ...	17 5 0 or 1,404 lbs.	1 2 0 or 86 lbs.	21 0 0 or 1,722 lbs.	
11	Do. ...	R. 26 ...	15 30 4 or 1,292 lbs.	0 30 2 or 61 lbs.	15 2 8 or 1,235 lbs.	
12	Do. ...	Dacca green ...	18 31 12 or 1,541 lbs.	1 10 0 or 102 lbs.	25 0 0 or 2,050 lbs.	
a	Do. ...	Ditto ...	11 32 8 or 967 lbs.	1 3 11 or 89 lbs.	21 33 12 or 1,791 lbs.	
b	Do. ...	Ditto ...	16 8 12 or 1,329 lbs.	0 33 5 or 68 lbs.	16 24 4 or 1,361 lbs.	
c	Do. ...	Ditto ...	16 14 12 or 1,342 lbs.	1 6 9 or 95 lbs.	23 11 4 or 1,909 lbs.	
d	Do. ...	Ditto ...	17 32 4 or 1,460 lbs.	1 7 8 or 97 lbs.	23 30 0 or 1,947 lbs.	

Block B. 1a.

Plot No.	Area.	Varieties.	Actual green weight.	Actual weight of fibre.	Outturn of fibre per acre.	Remarks.
	Acre.		Mds. sr. ch.	Mds. sr. ch.	Mds sr. ch.	
1	1-17th	Dacca green ...	15 9 2	0 38 14	17 0 5	
			or	or	or	
			1,248 lbs.	79 lbs.	1,394 lbs.	
2	Do. ...	Ditto ...	17 6 9	1 2 6	18 21 9	
			or	or	or	
			1,407 lbs.	87 lbs.	1,526 lbs.	
3	Do. ...	R. 26 ...	16 4 15	0 28 14	12 25 5	
			or	or	or	
			1,322 lbs.	59 lbs.	1,035 lbs.	
4	Do. ...	Dacca green ...	17 10 0	1 2 0	18 15 0	
			or	or	or	
			1,414 lbs.	86 lbs.	1,506 lbs.	
5	Do. ..	R. 30 ...	19 13 14	0 34 14	15 10 5	
			or	or	or	
			1,586 lbs.	71 lbs.	1,250 lbs.	
6	Do. ...	Dacca green ...	20 24 13	1 13 3	23 7 12	
			or	or	or	
			1,690 lbs.	108 lbs.	1,922 lbs.	
7	Do. ...	R. 62 ...	21 0 15	1 5 2	19 29 11	
			or	or	or	
			1,724 lbs.	92 lbs.	1,618 lbs.	
8	Do. ...	Dacca green ...	20 30 2	1 13 8	18 16 4	
			or	or	or	
			1,701 lbs.	109 lbs.	1,510 lbs.	

1 (*c*). *Aus paddy.*—Kataktara was tested against the two heaviest yielding loca *aus* paddies viz., Kasiapanja and Marichbuti. The experiment was arranged by the Economic Botanist. The sowing was a little late. The germination of Kataktara was very good but subsequently some of the plots were badly affected by Rhyzoctonia. The uniformity of the outturn was therefore affected. The experiment will be repeated next year.

1. (*d*) *Aman paddy.*—Indrasail was tested this year under the instructions of the Economic Botanist against the two following heaviest yielding local aman paddies, viz., Gazia and Elai. The plots were not quite ideal as the situation of the plots was a little higher. The plots got badly dried by the end of October the results were therefore not conclusive. The following were the results :—

No. of plot	Area.	Varieties.	Date of transplanting.	Date of flowering.	Date of harvesting.	Actual outturn.	Outturn per acre
			1919.	1919.	1919.	Mds. srs. ch.	Mds. srs. ch.
7	$\frac{1}{20}$th acre each.	Indrasail ...	28th Aug....	20th Oct. ...	29th Dec. ...	0 19 0	9 20 0
7	Ditto ...	Gazia ...	28th ,, ...	12th ,, ...	18th ,, ...	0 20 8	10 10 0
7	Ditto ...	Indrasail ...	28th ,, ...	20th ,, ...	29th ,, ...	0 22 2	11 3 0
7	Ditto ...	Elai ...	28th ,, ...	12th ,, ...	19th ,, ...	0 22 12	11 15 0

The experiment will be repeated next year.

2. *Manurial experiments with jute.*—Rhyzoctonia attacked jute in 1915 first in a virulent form. Since then the Fibre Expert is conducting experiments to find out if the application of potash in soil deficient in the element can at least lessen the severity of the disease if not prevent it altogether. Fifteen one-tenth acre plots were taken for the experiment as is shown in the diagram below :—

Block B. 1b.

15 $\frac{K\ O}{2}$	10 check	5 $\frac{K\ O}{2}$
14 check.	9 $\frac{K\ O}{2}$	4 $\frac{K\ O}{2}$
13 $\frac{K\ O}{2}$	8 $\frac{K\ N\ O}{3}$	3 check.
12 $\frac{K\ O}{2}$	7 check.	2 $\frac{K\ O}{2}$
11 check.	6 $\frac{K\ N\ O}{3}$	1 $\frac{K\ O}{2}$

All the plots received Nitrogen at 40 lbs. per acre as cow-dung. Plots 1, 2, 4, 5, 9 12, 13 and 15 received in addition potash at 115 lbs. of K_2O per acre. Plots 6 and 8 received a top dressing of 5 lbs. of KNO_3 after the first weeding. The total number of plants attacked by the disease in each plot is given below :—

Plot No.	Number of plants attacked.	Remarks.
1	Nil.	
2	1.	
3	Nil.	
4	4.	
5	8.	
6	3	The general growth of plant was not very satisfactory.
7	6.	
8	20	
9	5	
10	Nil.	
11	8	
12	25	
13	15	
14	4	
15	6	

4. *Distribution of seeds.*—The following seeds have been supplied from this farm for distribution :—

	lbs.
Pusa Wheat No. 12	1,558
Indrasail	12,300
Sugarcane sets	85,600

Sets of the following varieties of canes have been supplied :—

Yellow Tana, Gandari, Striped tanna, Vendamukhi B. 3,412, Khagri and B. 147.

5. *Miscellaneous.*—

I.—*Bullocks.*—During the year 5 pairs of new bullocks have been purchased. The total stock now consists of 18 heads.

II.—*Poultry.*—The present stock consists of 4 pure Buff Langshan fowls and 10 deshi ducks. During the year 8 fowls and 209 eggs have been sold to improve the deshi stock of the villagers. The demand of these superior birds is increasing every year. A second class certificate was awarded to our Langshan cock in the last poultry exhibition in Calcutta.

III.—*Training in Practical Agriculture.*—There were 3 apprentices during the year. One was sent by the District Board of Noakhali for special training in the cultivation of sugarcane and from here he went to the Burirhat Farm for training in tobacco cultivation. The other two are still continuing their courses.

IV.—*Farm Exhibition.*—An agricultural exhibition was held at the Rajshahi Farm on the 27th March. It was opened by the Collector with a suitable speech. Demonstrations were shown in ploughing with different kinds of plough, use of different kinds of harrows, irrigation by chain pumps, curing of tobacco and cigar-making, gur-making, best mode of planting sugarcane and the use of the incubator. Pamphlets in Bengali detailing the work done by the Agricultural Department in the Rajshahi district and in the farm by way of agricultural improvements were distributed to the visitors. Sample of crops grown in the farm together with a collection of district crop samples were put up in a stall. Samples of improved paddy, jute, Darjeeling potato, Tana sugarcane grown by the cultivators under the supervision of the Agricultural Department were exhibited.

A few pairs of fine cocks and hens, English breed, were exhibited by the farm side by side with those exhibited by the cultivators raised from eggs supplied by the farm.

A few prizes were awarded for the best samples.

V.—*Inspection and Visit.*—The Farm was frequently inspected by the Deputy Director of Agriculture and the Superintendent of Agriculture. The Director of Agriculture, the Fibre Expert and the Economic Botanist have also inspected the farm twice. The Hon'ble Mr. J. G. Cumming, I.C.S., and the Commissioner of this Division have visited the farm once. The Indian Sugar Committee visited the farm once. The Collector paid three visits to the farm. Besides the above, the farm was visited by many cultivators, zemindars and local gentlemen interested in agriculture.

6. *Establishment.*—Babu Utpal Sarker held the charge of this farm during the whole of the year. Besides the Farm Superintendent the staff consisted of one Assistant Farm Superintendent, one Overseer and a fieldman clerk.

7. *Receipts and Expenditure* :—

Receipts.	Rs.	Expenditure.	Rs.
Sale proceeds credited to Treasury	2,271 9 6	The total expenditure including experimental and capital charges on bullocks, etc., buildings, laying out plots and wages of apprentices	8,504 0 0
Bills outstanding	1,532 8 9		
Valuation of stock in hand ...	2,721 15 6		
Total ...	6,526 1 0		

APPENDIX XIV.

ANNUAL REPORT OF THE DEMONSTRATION FARM, ST. ANDREW'S COLONIAL HOMES, KALIMPONG, FOR THE YEAR 1919-20.

1. *History and Situation.*—Kalimpong is a subdivision of the district of Darjeeling, and is the headquarters of a large Government estate of 401 square miles called "Daling."

It has a fairly large bazar, and is the mart for the produce of a considerably large area. It is the centre of Tibetan trade with Bengal.

Kalimpong proper is 11 miles by road from the nearest railway station, Kalimpong Road, a station on the Siliguri-Teesta Valley Extension of the Darjeeling Himalayan Railway.

The Demonstration Farm is situated below the bazar on the south-easterly slope, which runs down to the Rilli river, a tributary of the Teesta, joining the latter at Ryang.

Area and Elevation.—The Farm was established by Dr. Graham in 1907-08 with about 24 acres of land on behalf of the St. Andrew's Colonial Homes, for the benefit of the Homes' boys who were being trained in every branch of Agriculture for the Colonies, also for the local cultivators and to bring to their notice our success with various improvements for adoption. Now the Farm has an area of about 76·50 acres of which nearly 11 acres are utilised by roads, cooly houses, farm buildings, with some waste lands and plots growing trees and bamboos, leaving about 65·50 acres for cultivation.

The elevation of the farm is as follows :—

	Ft.
Lower boundary	3,317
Farm buildings	3,693
Upper boundary	3,864

2. *Irrigation.*—The only irrigation necessary for the paddy crops is obtained from the natural rainfall, and this consists of turning the water out of the many streams on to the rice terraces when required. For vegetable and fruit cultivation during the winter and dry seasons, irrigation is arranged, through pipes from the natural springs around which pucca stone vats have been built. These springs are situated in the heart of the farm and are never dry, and supply the whole establishment with water.

Character of the soil.—The soil is a rich clay loam whose reaction is acid.

3. *Meteorology.*—The following table gives the normal rainfall for eleven years and that of 1919 at the Demonstration Farm :—

Month.	Normal 11 years.		1919.	
	Rainfall.	Rainy days.	Rainfall.	Rainy days.
1919.	Inches.	Inches.	Inches.	
January	0·29	1·4	0·57	2
February	1·03	5·0	1·01	5
March	1·66	5·0	0·73	3
April	2 49	10·2	1·18	8
May	5·62	17·0	5·12	18
June	21·37	22·2	20·14	23
July	26·13	27·7	25·44	28
August	21·43	25·6	17·90	25
September	11·50	18·4	13·04	23
October	3·77	6·4	0·14	3
November	1·17	2·2	...	...
December	0·34	1·4	...	...
Total ...	96·80	142·5	85·27	138
1920.				
January	...	...	Nil	Nil
February	...	...	·14	1
March	...	...	·37	5

From the above figuret it will be noticed that the season was unfavourable for the maize crop, while there was sufficient rainfall for the paddy crops at the outset, but the absence of rainfall during the months of October and November ruined practically all the secondary crops, such as buckwheat, dal, kodo, soybeans, etc. It may also be brought to notice the scanty rainfall registered on the farm from October 1919 to March 1920 being ·65 only on 9 days, while last year during this period we had 2·49 inches in 14 days.

4. *Operations during the year.*—(A) *General crops grown.*—The following table gives the area under each crop grown by the farm, and on the half-crop system, with the total outturn, yield per acre, cost of cultivation, price per maund (82 lbs.) and total value of crops :—

Crops.	Area in acres.	Outturn in lbs.	Yield per acre in lbs.	Cost of cultivation per acre.	Price per maund 82 lbs.	Total value of crops.	Grand Total.
				Rs. A.	Rs. A.	Rs. A. P.	Rs. A. P.
Maize	26·50	58,220	2,196	39 0	6 8	4,615 0 0	5,083 0 0
Do. half-crop ...	6	5,904	984	...	6 8	468 0 0	
Paddy (aman) ...	14·50	29,335	2,022	44 0	4 0	1,431 0 0	2,174 8 6
Do. straw ...	14·50	69,484	4,792	...	0 12	635 8 6	
Do. half-crop ...	2·25	1,722	764	...	4 0	84 0 0	
Do. half-straw ...	2·25	2,624	1,166	...	0 12	24 0 0	
Kodo	7	11,049	1,578	56 0	5 0	673 12 0	1,150 0 0
Do. half-crop ...	14·50	7,810	538	...	5 0	476 4 0	
Ghaiya (aus paddy) ...	·50	594	1,189	45 0	4 0	29 0 0	36 8 0
Do. straw ...	·50	2,460	4,920	...	0 4	7 8 0	
Buckwheat ...	2	574	287	17 0	5 0	35 0 0	...
Bhatmas (soybean) ...	4·50	2,378	528	25 8	6 0	174 0 0	...
Gahat dal ...	1	369	369	25 0	4 0	18 0 0	...
Kalai dal ...	2	389	194	26 8	7 0	33 4 0	...
Mashyem dal ...	2	53	26	25 8	5 0	3 4 0	...
Potatoes ...	1·50	1,886	1,257	98 0	5 0	115 0 0	...
Tobacco	·50	205	410	29 0	12 8	31 4 0	...
Arrowroot ...	·10	100	1,000	350 0	60 0	75 0 0	...
Sugarcane ...	1	5,309	5,309	155 0	11 0	712 4 0	...
Khar (thatching grass)	2	11,480	5,740	15 0	0 8	70 0 0	...
Fruit culture ...	6·50	...	...	35 0	...	1,572 4 6	...
Vegetable ...	2·25	...	...	275 0	...	1,017 2 6	...

From the above figures it is evident that maize and Kodo, in rotation are economically the most profitable crops for these hill sides. Kodo, buckwheat, Soybeans, Kalai Dal and other pulses are grown after maize on the same land in the one year, but none of the latter named crops is so popular as Kodo. Ghaiya or *aus* paddy does well on open slopes, when sown in rows. *Aman* paddy is also cultivated on a profitable scale, and good results are usually obtained, if a sufficient supply of water from the jhoras is constantly diverted into the paddy areas till the second week of October. The other crops such as *kalai dal*, soybeans, Mashyen and various other pulses, and Buckwheat give unsatisfactory results and are not encouraging. Sugarcane for manufacture of *Gur* also fruit, vegetable and arrowroot culture are very profitable. These are receiving special attention and encouragement.

(B) Experimental work :—

Primary—

1. Maize.
2. Winter paddy (*aman* paddy).

Secondary—

3. Autumn paddy (*aus* paddy).
4. Kodo.
5. Buckwheat.
6. Soybeans and *dals*.
7. Sugarcane.
8. Miscellaneous fruits, vegetable and arrowroot culture.

1. *Zea Mayo, Maize, Makai, Bhutta.*—In 1907-1908 experiments have been carried on year after year on this farm to improve the quality of the local maize seeds and to retain a few selected and true to type varieties which are likely to give good results everywhere in the district. After many years of experiments and special attention devoted to this work, we have now on this farm five varieties, *i.e.*, yellow round, yellow flat, white round, white flat and red round. These five varieties have been grown on large areas and we find the seeds are very true to type and heavy yielders. To enable us to retain these five types of maize varieties as true and heavy yielding, we have annually two periods for the selection of seeds. first a preliminary one in the fields at the time of harvesting in August, and the second or final selection in March just before sowing the new crop from the preliminary selected cobs.

The average outturn per acre of all varieties of maize under experimental cultivations on 11 acres for the past seven years is as follows :—

	Mds.	s.	or lbs.
1913-14	33	30	2,767
1914-15	30	39	2,539
1915-16	31	36	2,615
1916-17	31	28	2,599
1917-18	28	35	2,367
1918 19	29	10	2,398
1919-20	30	19	2,498

The above figures speak for themselves showing the benefit derived from careful selection and preservation of seeds. Seed was sown at the rate of 35 lbs. per acre, between the third and fourth weeks of March and manure applied at the rate of 175 mds. or 14,350 lbs. per acre. The crop was harvested from the beginning of the 2nd week to the end of August. The proportion of grains to cobs, with leaves attached, was 51·75 per cent.

(*a*) *Varieties.*—The variety experiment has given the following results for the past seven years :—

Variety Experiment.

Varieties.		Outturn per acre.						
		1913.	1914.	1915.	1916.	1917.	1918.	1919.
Yellow round ...	Mds. ...	37¼	33¾	33⅝	29⅛	23	27	29⅛
	lbs. ...	3,054	2,767	2,757	2,388	1,886	2,214	2,449
Yellow flat ...	Mds. ...	26¾	22	29	30⅜	26	29½	33⅜
	lbs. ...	2,203	1,804	2,378	2,490	2,132	2,419	2,736
White round ...	Mds. ...	33¼	37	35½	33⅞	34½	27¼	29¼
	lbs. ...	2,726	3,034	2,911	2,777	2,829	2,234	2,398
White flat ...	Mds. ...	35	31¼	23¾	37¼	37½	32½	34⅝
	lbs. ...	2,870	2,562	1,947	3,054	3,075	2,665	2,839
Red round ...	Mds. ...	30½	30½	36	32⅛	31	31	33⅞
	lbs. ...	2,501	2,501	2,952	2,634	2,542	2,542	2,777
Suttons giant ...	Mds. ...	...	...	...	10¾	15¼	20	25⅛
	lbs. ...	...	...	...	881	1,250	1,640	2,060

These figures are from one acre blocks and the figures backed up by the average from the farm require no comment.

(*b*) *Effects of terracing.*—To compare the results of growing ordinary crops (not irrigated paddy) on terraced and unterraced lands, two acres were selected, as uniform in fertility and slope as was possible to find on the farm. One acre was terraced at the cost of Rs. 107-5-6. Each plot received similar treatment, equal amounts of manure and seeds being applied. The following table shows the outturn and cost of cultivation of maize and secondary crops for the past seven years.

Terraced *vs.* Unterraced Experiment.

Terraced acre.			Unterraced acre.		
Crop.	Outturn	Cost of cultivation.	Crop.	Outturn.	Cost of cultivation
1913-14.	lbs.	Rs. A. P.	1913-14.	lbs.	Rs. A. P.
Maize	2,466	37 10 0	Maize	2,911	37 10 0
Kalai dal—			Kalai dal—		
Grain ...	410	25 0 0	Grain ...	389	25 0 0
Straw ...	553			410	
1914-15.			1914-15.		
Maize	2,566	37 9 0	Maize	2,933	38 1 0
Buckwheat—			Buckwheat—		
Local ...	358	14 9 0	Local ...	369	14 9 0
1915-16.			1915-16.		
Maize	2,829	33 5 0	Maize	3,308	33 8 0
Soybeans—			Soybeans—		
Barmali ...	410	22 8 0	Barmali ...	287	22 0 0
1916-17.			1916-17.		
Maize	2,675	36 0 0	Maize	2,798	36 8 0
Kodo—			Kodo—		
Straw estimated at Rs. 5.	1,886	46 0 0	Straw estimated at Rs. 5.	1,732	46 0 0
1917-18.			1917-18.		
Maize	2,747	38 0 0	Maize	2,644	38 0 0
Dal kalai—			Kalai dal—		
Grain ...	481	23 0 0	Grain ...	502	23 0 0
Straw ...	984		Straw ...	1,025	
1918-19.			1918-19.		
Maize	2,644	36 4 0	Maize	2,419	36 2 0
Buckwheat—			Buckwheat—		
Local ...	307	15 4 0	Local ...	317	15 6 0
1919-20.			1919-20.		
Maize	2,900	38 0 0	Maize	2,592	38 0 0
Soybeans—			Soybeans—		
Barmali ...	381	26 0 0	Barmali ...	410	26 0 0

After 9 years of experiments on these two areas, we find that during the past three years the terraced acre has shown a marked improvement over the unterraced in the main crop, while it will be seen that the secondary crop has done better on the unterraced area.

(*c*) *Manurial Experiments.*—Three plots of half acre each have been reserved for this experiment since 1910-11. The condition of the soil in each plot is fairly uniform, and the situation of each plot is approximately at the same level.

For the past 8 years this manurial experiment has been continued and yearly the half-acre with superphosphate, plus farm yard manure has given the best results of the three. It was therefore decided to give up applying all manures on these areas and to

work these three half-acres as unmanured areas for three or four years to find out how the crops are going to fare. The following results were obtained these last two years with maize and kodo in rotation :—

½ acre plots.	Manure per acre.	Outturn of maize per acre.		Outturn of kodo per acre.	
		1918-19.	1919-20.	1918-19.	1919-20.
		lbs.	lbs.	lbs.	lbs.
1.	8,200 lbs farm-yard manure and 164 lbs. Superphosphate	2,254	2,234	1,886	1,802
2.	8,200 lbs. farm-yard manure...	1,968	2,111	1,752	1,748
3.	Unmanured	1,558	1,701	1,472	1,461

The results obtained these past two years show a marked decrease in yields in all three half-acres to that of the figures as compared with the eight years of constant manurial. Tnis year under report no manurial experiments were undertaken with nitrate of soda, as the price of this manure was prohibitive.

The ordinary mule manure which we purchase at Re. 1-11 per ton is the most economical and effective.

The yellow round variety of maize is extensively cultivated and is a great favourite being the hardiest and most profitable, it is popular with cultivators and merchants. The white round is another favourite and both these varieties are made into maize meal or rice and is the staple food of the hill people. It is also eaten as porridge by the European. The red round is not cultivated much, although we find it one of our best yields. There seems to be no market for it and is chiefly given to poultry and animals. The white and yellow flat varieties are very well known by the hill people to be heavy yielders, but as the thin end of the cob is usually open, it is very accessible to weevils and mildew, hence the cultivators are rather reluctant in growing same on a large scale and generally sell the crop soon after harvesting.

Since 1916 Sutton's Giant Maize has been experimented with on one acre plot, and we find that although the seeds are double the size of our local white flat maize, the returns are satisfactory, but unfortunately they suffer the same way as our white and yellow flat varieties.

2. *Oryza Sativa– Winter Paddy—Aman Dhan—Transplanted Paddy*—Owing to the proximity of this farm to the hill ridge a very limited space is left to act as a collecting ground for water, and the crop in consequence is almost entirely dependent on the incidence of rainfall during these months to ensure that continuous supply of water which is so essential for its growth. The seed beds are sown by the third week in May, and transplanting commences by the end of June, and is completed by the end of July. The harvesting takes place soon after the first week in November and continues to the end of the month.

During the year under report three different kinds of experiments have been conducted with paddy, viz., (*a*) elevation, (*b*) variety and (*c*) manurial.

(*a*) *Elevation.*—This experiment with Touli Variety of paddy has been undertaken since 1915-16 to ascertain at what altitude paddy would do best on the farm and the surrounding hill sides.

Elevation Experiment.

Serial No.	Area in acres.	Approximate elevation.	Variety.	Outturn in grain and straw.	Yield per acre.	Cost of cultivation.
		Feet.		lbs.	lbs.	Rs. A. P.
1	5·75	3,317—3,450	Touli	11,480G. / 18,040S.	1,996G. / 3,137S.	254 4 0
2	3·0	3,550—3,650	„	4,981G. / 10,660S.	1,660G. / 3,553S.	137 8 0
3	2·33	3,500—3,700	„	3,321G. / 7,872S.	1,423G. / 3,373S.	122 0 0
4	1·0	3,775—3,800	„	1,117G. / 2,460S.	1,117G. / 2,460S.	42 15 0

During the past four years of this experiment it has been proved that the lowest elevation area has yielded the best results.

(*b*) *Variety.*—The following variety experiment has been continued since 1909-10 and the figures shown below are for the past three years :—

Variety Experiment.

Varieties.	Outturn per acre.					
	1917-18.		1918-19.		1919-20.	
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.
	lbs.	lbs.	lbs.	Rs.	lbs.	lbs.
Touli	1,394	2,624	1,435	2,952	1,694	2,583
Dhanasi	1,476	2,870	1,066	2,542	1,271	4,346
Mansara	1,558	2,952	1,599	3,034	1,681	3,280
Ratomarsi	1,230	2,788	1,558	2,870	1,763	3,321
Timuray	1,189	2,788	1,312	2,706	1,804	4,018
Ramtulshi	1,025	2,788	1,271	2,624	1,353	3,034

From the above figures is it difficult to judge which is the best yielder? Some varieties require plenty of irrigation and ripen earlier while others do not, and when the rainfall is heavy or light, as the case may be, the varieties either suffer or give good outturns, on the whole touli seems to be slightly the best as it has been proved to be drought resisting, at the same time can withstand excessive rainfall and grown at very low and high altitudes. This variety is cultivated chiefly on the farm.

(*c*) *Manurial.*—During the past ten years an experiment has been conducted to note the effects of green manuring, as compared with farm yard manure and an unmanured plot with touli variety of paddy.

The results of the last three years are here recorded :—

Manurial Experiment.

Manure.	Outturn per acre.					
	1917-18.		1918-19.		1919-20.	
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1. Unmanured	1,230	2,706	1,291	2,583	1,260	3,013
2. 4,100 lbs farm yard manure	953	2,952	984	3,075	768	3,597
3 Green manured Soybeans ...	1,445	2,583	1,414	2,767	1,383	3,259

From these figures there does not appear to be any advantage from farm yard manuring. Unmanured and green manured areas have always given better results. It is never the practice to manure paddy areas on these hill sides, as the washings, etc., from above reach unmanured fields from the *jhoras.*

3. *Oryza Sativa—Autumn Paddy—Aus Dhan or Ghaiya—Unirrigated Paddy.*—This crop is usually sown broadcast on slopes thoroughly exposed to wind, air and well drained. On the farm it is sown in rows at 18-inch seeds dibbled in at 8 inch apart. The results of the last three years are given below :—

		Grain.	Straw.
1917-18	1 acre plot	738	6,988
1918-19	1 „	902	6,560
1919-20	1 „	1,189	4,920

This year's figures show a marked improvement in the yield, in comparison to that of the past four years, due to the introduction of new seeds purchased outside this locality, being got direct from Sikkim.

4. *Eleusine Coracana—Millet-Kodo.*—This crop grows in rotation with maize and is transplanted from the 3rd week in June to the end of July, so that when the maize crop is harvested in August, the kodo covers the land, having well developed in the interval.

The following table shows the average outturn per acre from 1914 to 1919 from six acres of land under kodo, cultivated by the farm :—

Kodo outturn for six years.

	Lbs.
1914	1,886
1915	1,909
1916	1,640
1917	1,790
1918	2,099
1919	1,928

During the past five years an experiment has been conducted to test the yield of two varieties, the curly closed and the open loose varieties of the kodo cultivated extensively on these hills, and the results obtained are as follows :—

Kodo Variety Experiment.

Year.	Variety.	Area in acres.	Outturn.	Cost of cultivation.	Value of crop.
			lbs.	Rs. A.	Rs. A.
1915-16 ...	Curly closed	1	1,763	43 8	80 4
	Open loose	...	1,906	47 0	86 6
1916-17 ...	Curly closed	1	1,804	45 0	65 8
	Open loose	...	1,937	47 8	70 0
1917-18 ...	Curly closed	1	1,829	48 8	56 9
	Open loose	...	1,908	49 0	60 0
1918-19 ...	Curly closed	1	1,906	49 0	80 9
	Open loose	...	2,009	49 8	84 10
1919-20 ...	Curly closed	1	1,814	60 0	115 10
	Open loose	...	1,916	60 8	121 14

The open loose variety has so far annually given the best results, inspite of its shedding a good percentage of its grains at the time of harvesting. This variety is cultivated extensively, because it grows equally well on manured as well as unmanured soil, compared to the curly closed variety which only gives good results on well manured areas.

The straw is estimated at Rs. 5 per acre, and this is used for grazing. The grains were sold this year at Rs. 5 per maund early in March 1920, which is a good price and the highest we have received to date.

5. *Fagopyrum Escubentum—Buckwheat—Phaphar.*—This crop is grown in rotation after maize. Seed is sown in the beginning of September and is ready for harvesting by the end of November. Two acres were put under this, and due to practically no rainfall in October and November at the time when the crop was in full blossom, the whole crop was more or less a failure, the returns being very poor. This crop takes 99 per cent. of plant food from the soil, and although it is a crop which destroys weeds wholesale the cultivators are not very fond of growing same. Buckwheat is chiefly grown by Lepchas and Bhutias on barren soil and at high elevations.

6. *Leguminous crops*—The following belonging to this order are grown in this district and on this farm :—

Botanical name.	English name.	Nepali name.	Number of varieties.	Remarks.
Glysine Hispida ...	Soybean ...	Bhatmas ...	6	Lepcha name Silliyan.
Phaseolus Mungo ...	Dal (lentil) ...	Dal kalai ...	2	
Phaseolus Calcaratus ...	Ditto ...	Mashyem ...	3	
„ Sublobatus ...	Ditto ...	Ditto ...	1	This species is often called Gyrans.
Dolichos Biflorus ...	Ditto ...	Gahat ...	3	

(*a*) *Soybeans*—(*Glysine Hispida*)—The following varieties were grown on the farm on one acre plots and figures for the past six years are given below :—

Soybeans.

Variety.	Area in acres.	1914-15	1915-16.	1916-17.	1917-18.	1918-19.	1919-20.	Remarks.
		Grains.	Grains.	Grains.	Grains.	Grains.	Grains.	
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
Nepali Bhatmas ...	1	1,681	820	1,148	902	1,148	1517	Whole season crop grows alone.
Barmali ...	1	697	410	861	543	430	396	Grows in rotation with maize.
Green ...	1	729	164	922	410	313	272	
Chocolate ...	1	799	635	820	656	522	610	
Black ...	1	676	440	984	797	635	410	
White ...	1	...	...	...	...	463	349	

The first two varieties are erect growing, while the last four mentioned are of trailing habits. All these leguminous crops can be grown in rotation with maize. However, Nepali soybeans produce very little when grown along with maize, but when grown alone yields heavily. They cannot, however, compete with maize or Kodo. The cost of cultivation of these crops was Rs. 25-8 per acre, except the Nepali variety; when grown alone in the open, cost Rs. 45 per acre. The value of the Nepali soybeans was Rs. 7 per maund 82 lbs. and of the other varieties at Rs. 5 per maund.

For the past three years the returns of the five latter varieties have been very poor due to drought.

(*b*) *Kalai dal*—(*Phaseolus Mungo*)—Two acres were again grown with this crop and an outturn of 389 lbs. of grain was obtained that is at 194 lbs. per acre. There is a great market for this dal and the price usually varies from Rs. to 6 to 8 per maund. The cultivators usually sow this crop on the ridges or ails of paddy fields.

(*c*) *Mashyem dal*—(*Phaseolus Calcaratus—Phaseolus Sublofatus*)—An area of 2 acres was cultivated with 3 varieties of this crop, and an outturn of 53 lbs. were obtained which is extremely poor due to drought.

(*d*) *Gahat dal* (*Dolichos Biflorus*)—An area of one acre was cultivated under this crop and an outturn of 369 lbs. of grain was obtained at a cost of Rs. 23. The grain was sold at Rs. 4 per maund (82 lbs.). This grain after it is boiled is said to be given as food to people suffering from small-pox, measles, etc. The rash it is further said, comes out of the body quickly, and the patient is well in a very short time.

7. *Sugarcane—Saccharum Officinarum*—This crop takes 18 months to come to maturity on these hills as compared with ten months on the plains. In April 1916 a terraced area of ·50 acre was planted with this crop, and has been increased since then to 1 acre. From this one acre an outturn of 64 maunds 30 seers or 5,309 lbs of gur was manufactured and sold at an average price of Rs. 11 per maund. The cultivation expenses incurred during the year was Rs. 155-4 while the total receipts were Rs. 712-4, giving us a clear profit of Rs. 577 per acre. After much encouragement and help rendered to the cultivators in this line, one persevering cultivator has seen the benefits of *Gur* making and has purchased a mill and pan and is working same according to our methods and instructions.

8. (*a*) *Potatoes* (*Solanum tuberosum*)—An area of 2 acres with two varieties *i.e.*, Sikkim red and Sikkim white have been planted on one acre plot each and as the crop is not ready for harvesting no figures can be given this year under report.

(*b*) *Fruit Culture.*—Special care is now devoted to this section of our work and an area of 6·50 acres (of which 3·02 acres is under the Darjeeling Improvement Fund as a Nursery for the supply of graftings, cuttings etc., etc., to the cultiuators of this district free of costs), is being cultivated with various kinds of fruit trees, such as local and Australian naval oranges, numerous varieties of limes, lemons, peaches, plums, apples, apricots, pineapples, loquats, pomegranates, cherries, bananas, tree tomatoes, grenadillas, (passion flower fruit). We have tried English fruit trees, but find they do not thrive at our elevation of 3,650 feet. A few Japanese and Australian fruit trees are being experimented with, and we have every hope of these succeeding.

Pineapples.—An experimental area of half an acre under pineapples of the "Queen Variety" was planted in September 1912. The following results have been obtained during the past 8 years since the time of planting to date :—

Pineapples.

Year.	Cultivation expenses.	Outturn in Pines and price.	Value.
	Rs. A.	A. P.	Rs. A.
1912-13 and 1913-14	102 10	54 at 2 6 ...	8 7
1914-15	27 4	497 „ 2 0 ...	62 2
1915-16	31 0	1,002 „ 2 0 ...	125 4
1916-17	35 0	2,700 „ 2 0 ...	337 8
1917-18	44 0	3,570 „ 2 0 ...	446 4
1918-19	54 0	4,260 „ 10 for Re. 1 ...	426 0
1919-20	67 0	3,845 „ 10 „ „ 1 ...	384 8
	360 14	15,928	1,790 1

After deducting all expenses in this connection, a profit of Rs. 1,429-3 has been made in eight years. The average outturn per acre is 3,982 pineapples. This next year we hope to discontinue this area under pineapples as the fruits have deteriorated in size and quality due to age.

From sale of fruits this year, including pineapples, a sum of Rs. 1,572-11-6 was realised at a cost of Rs. 227-8 giving a substantial profit of Rs. 1,345-3-6.

The following list of fruit-trees was sold and distributed free of cost to the public from our fruit nursery :—

Orange gooties and seedlings	398
Limes and Lemons	54
Plantain hooks	34
Pineapple suckers	6,705
Papaya Seedlings	83
Guava „	67
Peaches	42
Plums	71
Grenadilla Seedlings	9
Strawberry suckers	300

(*c*) *Vegetable Cultivation.*—During the year under report 2·25 acres were placed under this experiment, and practically all varieties of European and Indian Vegetables were cultivated at their respective seasons. Everytning has been grown with more or less success, and a sum of Rs. 1,017-2-6 was realised from the sale of these vegetables. The cultivation expenses, including the price of seeds and cost of manures applied for the 2·25 acres was Rs. 687-8. Our chief market has been Kalimpong although a large quantity was sent to the Tista Bridge Bazar in the winter months.

In addition to the above vegetable cultivation on this area at the beginning of May a $\frac{1}{10}$th of an acre plot from this 2·25 acres was cultivated with Arrowroot at a cost of Rs. 35 and an outturn of 100 lbs. of Arrowroot was manufactured from 1,236 lbs. of tubers harvested. The crop was sold at annas 12 per lb. fetching Rs. 75, thus yielding a profit of Rs. 40 or Rs. 400 per acre. The price of one maund of tubers sown on this small area has been included in the cost of cultivation.

Our object in taking up this vegetable cultivation on the farm is to introduce it amongst the ryots of the Government Estate, and to put them in the way of exporting their produce to Calcutta at suitable times as well as to provide for the needs of the New Hill Station of Kalimpong.

The following vegetable seedlings and seeds were sold to the public during the year under report :—

			Rs. A.	
Cabbage seedlings	...	6 varieties 2,300	at 0 12	per 100
Cauliflowers „	...	2 „ 2,800	„ 0 12	„
Knolkholes „	...	2 „ 400	„ 0 8	„
Sikhim Tea seeds	...	12 lbs.	„ 0 12	per lb.
Jerusalem Artichoke tubers	...	16 „	„ 0 8	„
Cauliflower seeds	...	10 „	„ 1 0	per oz.

To attain our object I find that the simplest and best method of inducing the cultivators to grow foreign vegetables, is to raise a large quantity of seedlings, and to sell these at reasonable rates.

An experiment was undertaken on ·25 acre of land with three varieties of tobacco, and an outturn of 205 lbs. of dry tobacco was harvested at a cost of Rs. 29 which was sold at 5 annas per seer.

Distribution of seeds, etc.—The following list of seeds, etc., were distributed to the public this year under report :—

Maize	...	Mds.	62·25 srs. or	5,135 lbs.
Paddy (*aus* and *aman*)	...	,,	5·25 ,, ,,	461 ,,
Soybeans	...	,,	13·35 ,, ,,	1,137 ,,
Buckwheat ...	...	,,	3·10 ,, ,,	266 ,,
Dals	...	,,	1·25 ,, ,,	133 ,,
Potatoes	...	,,	6·30 ,, ,,	553 ,,
Sugarcane	...	2,005 cuttings.		

Miscellaneous—(*I*) *Cattle.*—We have 16 draught bullocks on the farm for our work, at the same time a large number of ryots around. Our locality depend on our cattle for sowing their maize and paddy crops as they find it is far easier to pay Re. 1-8 a day to the farm for hire of a pair of bullocks with a ploughman and plough, working from 7 A.M., till 12 noon and from 1 P.M. to 4 P.M., per day than to keep their own. We have been very fortunate not to have any disease amongst our cattle this year.

(*II*) *Poultry.*—A start has been made in poultry farming, and so far we have two pure strains of birds, *i.e.*, White Wyandottes and White Orpingtons. Besides these we are rearing a large number of chickens of Wyandottes, Orpingtons and Leghorns and we hope to be in a position to give figures in our next year's report. The object with which we have taken up this special branch is to introduce these strains of birds amongst the cultivators.

(*III*) *Training and practical demonstration.*—A start has just been made and we have four demonstration centres in the Kalimpong subdivision, *i.e.*, Pedong, Git Beyong and Dubblin, Nimbong and Yok Primtam where we are demonstrating through a large number of ryots in these centres, with our improved maize seeds, and other improvements, also the introductions of Vegetable and Fruit Cultures on scientific bases, and conservation of farm yard manure in covered pits. Besides these for the past 6 years much good has been done for the cultivators around and about Kalimpong with the help of the Subdivisional Officer also through the kind help and interest of Dr. Sutherland, of the Normal Training School and the Misses Smith and Mackintosh of the Girls' Training School who bring down their boys and girls for lectures and practical demonstrations on maize seeds selection, preliminary and final, Gur making, and fruit and vegetable culture.

(*IV*) *Visits and inspections.*—Sir C. J. Stevenson-Moore, Mr. Swan, I.C.S., Deputy Commissioner, Darjeeling, twice.

Mr. Finlow, officiating Director of Agriculture, Bengal, along with Mr. Hector, Economic Botanist, Mr. McLean and Rai R. Das Gupta Bahadoor, Deputy Directors, inspected the firm in the month of September 1919, a second visit was made by the Rai Bahadoor in the month of February 1920.

9. *Management and establishment.*—I was the manager in charge during the year. The land for the farm was bought by the St. Andrew's Colonial Homes, and is subject to an annual rental of Rs. 83-12. The farm is managed by the Homes, and the Bengal Agricultural Department's grant of Rs. 5,000, *plus* half sale-proceeds is sufficient to pay for the upkeep of the farm. The remaining half of the sale-proceeds is credited to the Homes.

The programme of work for this farm is drawn up by the Agricultural Department.

10. *Receipts and Expenditure.*—A copy of the balance sheet for the year ending 31st March 1920 is given below :—

Receipts.	Rs.	A.	P.
Balance from 1918-19 ...	8	11	6
Government grant 1919-20 ...	5,000	0	0
Sale of farm produce ...	10,187	9	6
Miscellaneous receipts ...	455	0	0
Sale of bullocks ...	179	0	9
Total ...	15,830	5	9

Expenditure.	Rs.	A	P.	Rs.	A.	P.
Labour	4,320	5	0			
Superintendence ...	2,795	10	0			
				7,115	15	0
Miscellaneous, seeds, manures, repairs, postage, etc.				1,646	13	0
Bullocks purchased				248	0	0
Implements				64	1	3
Capital Outlay and Improvements ...				1,304	12	9
Half crop to Homes				5,093	12	9
Insurance policy of renewal ...				31	10	0
Poultry				325	5	0
Total ...				15,830	5	9

The total value of produce sold shows an increase of Rs. 3,579-1-6 from that of last year. The increase is chiefly due to high prices received for grains and also from sale of fruits and gur.

The wages bill for monthly and daily labour shows an increase of Rs. 774-14-9 due to increase in the wages of labour and to terracing and improvements on the farm.

We are again indebted to Mr. H. F. Green of Munsong Cinchona Plantation for his kindness in valuing the farm stock as at 31st March 1919 was Rs. 1,935 as compared with 31st March 1920, Rs. 2,436.

Henry R. Edmunds,
Manager.

APPENDIX XV.

ANNUAL REPORT ON SERICULTURAL OPERATIONS, BENGAL, FOR THE YEAR 1919-1920.

The general control and management of the whole operations in Bengal continued in the hands of the Bengal Silk Committee, consisting of the Director of Agriculture, Bengal (President), with the members, the Collectors of Malda and Murshidabad, Messrs. deMinvielle and Ariff.

During the year under review, the Committee held three meetings.

ADMINISTRATION.

I remained in charge during the year.

DISINFECTION OF VILLAGE REARING HOUSES AND RAISING SEEDS THROUGH THE SELECTED PROFESSIONAL REARERS.

The system of disinfection of village silk-worm seed-rearing houses, commenced in the year 1910, has been carried on during the year under report, but could not be extended owing to lack of staff.

The popularity of the selected rearers' seed is increasing in the market and all their seed has been readily sold for cash.

TOURS.

I spent 281 days on tour and inspected the different nurseries and villages as often as practicable.

The points which specially engaged my attention were as follows :—

1. (*a*) The production and increase of disease-free seed from the Government Central Nurseries.

2. Supervision over the production of disease-free seed by the selected professional silk-worm rearers :—

Owing to the necessity for strict and continual supervision, which is absolutely necessary to prevent the selected rearers from selling inferior seed, the number of selected rearers has only been increased by two, both near the Amriti Central Nursery at Malda. One of these is a Joint Stock Company—the share-holders being the richest zamindars and gentlemen of the town, as also professional rearers. If this enterprise is successful it will open still another outlet to educated Indians seeking an alternative to Government service.

3. Comparison of selected rearer's seed with that produced in Government nurseries.

4. Through disinfection both of Government nurseries and of the houses of selected professional rearers.

5. The improvement of the mulberry lands attached to each of the Central nurseries by manuring and good cultivation, only Rs. 3,573-2 an insufficient amount was available for this purpose during the year under review.

6. The extension of the area of mulberry lands.

7. The planting of "selected" mulberry in the lands attached to the nurseries and the supply of the cuttings to the raiyats, mostly free of cost. The "selected" mulberry which was brought from the Punjab over 30 years ago is less liable to the attack of "Tukras."

8. The improvement of the ordinary village-rearing houses by raising the floors and opening ventilators and windows for light and air and with a view to drying the floors. The high price of wire gauze has prevented improvements on an extended scale in this direction since 1916.

THE PRESENT CONDITION OF THE SILK INDUSTRY IN BENGAL.

Since the year 1910 the price of the home-reeled silk has steadily risen more especially during the year under review. Cocoons which used to be sold at an average of Rs. 30 per maund of green cocoons as late as the year 1909 brought up to Rs. 70 in 1919 and during the present year up to Rs. 96 or more.

The improvement in the industry has had the effect of increasing the area under mulberry up to last year 6,147⅔ acres, or 33 per cent. and during the year under review, although no proper census of mulberry could be taken, but it is ascertained that nothing less than 1,000 acres have been extended. Other non-rearers have also recently taken to rearing silk-worms.

Taking into consideration the increase of 1,000 acres during the past year, the total area under mulberry now comes to 25,335⅓ acres. The annual average outturn per acre being about 360 kahons of cocoons, the increased production during the year under review amounts to about 360,000 kahons (1 kahon is equal to 1,280). To supply seed-cocoons for the total annual requirements of the province about 91,000 kahons would be

required, of which we have actually supplied during the year under review 20,122 kahons 9 pons 11 gondas, directly from the Government nurseries. Through the selected professional silk-worm rearers, under the direct supervision of the nursery superintendents, a further 5,836 kahons were supplied. Thus we have supplied about 28 per cent. of the total quantity of seed required for the crop in Bengal, *i.e.*, an increase of 3 per cent. over the last year, after allowing for the increased use of seed cocoons due to the extension in the area under mulberry.

Nurseries.

The following is a list and description of the Nurseries during the year :—

1. *Malda district.*—(1) Piasbari Central Nursery, containing 5 large and 1 small (halfsize) rearing houses with 64 bighas and 15 cottahs of mulberry lands, of which 2 bighas 16 cottahs contain "selected" mulberry planted at 3 and 4 and 5 and 6 feet apart. This nursery contains many tanks and ponds from which the Bhodes are used in heavy dressing as manure for mulberry lands as funds are available in the budget.

His Excellency the Governor of Bengal visited this nursery on the 22nd November 1919 and was pleased to express his satisfaction with what he saw.

His Excellency inspected the co-operative bank and the primary school started last year for teaching improved methods of sericulture to the sons of rearers.

2. Amriti Central Nursery contains 4 large and 2 small rearing houses. The production of mulberry could not be increased much by manuring the mulberry lands owing to want of funds. During the year 1 bigha 15 cottahs of "selected" mulberry was planted in the place of Deshi mulberry at 5 feet apart. The total area of mulberry lands was 83 bighas 15 cottahs, of which 5 bighas of high land were pulled down to utilize the earth for filling-up the unhealthy drains and ditches.

The present total area of mulberry land is 79 bighas.

This is the only nursery which has remained unhealthy. Malaria is so bad that during the last rains the whole staff fell ill. Nearly Rs. 2,000 were spent in filling up breeding places of mosquitoes ; but further work is required and the nursery remains unhealthy.

The Hon'ble Revenue Member, Bengal Executive Council, visited the Amriti Central Nursery on the 28th June 1919.

The Director of Agriculture, Bengal, visited the Amriti Nursery on the 29th June 1919.

Under the supervision of the Superintendent of Amriti Central Nursery the Bangalgram rural bank organised about one and half year ago, did well. The working of the Bangalgram Bosni Society was so satisfactory that the rate of interest has been reduced from Re. 1-9 to Re. 1-4-9. Two other banks have been organised and the papers have been sent to the Registrar, Co-operative Societies, Bengal, for registration.

3. *Murshidabad District.*—Kumarpur Central Nursery contains four rearing houses with 39 bighas 14 cottahs and 7 chitaks and 3 gandas of mulberry lands, of which 2 bighas have been planted with "selected" mulberry at 5 feet apart and 7 bighas at 2 feet apart.

Here I have started a village co-operative credit bank—the "Kumarpur Jautha Bank"—under the supervision of the superintendent himself.

4. Chandpur Centrral Nursery contains four rearing houses with 41 bighas 1 cottah and 4 chataks of mulberry lands, of which 18 bighas 5 cottahs have been planted with "selected" mulberry at 4 and 5 feet apart.

5. *Birbhum District.*—Kalitha Central Nursery contains four rearing houses with 55 bighas of mulberry lands of which 14 bighas have been planted with "selected" mulberry at 3 and 5 feet apart.

6. *Rajshahi District.*—Mirganj Central Nursery—Contains 5 rearing houses with 59 bighas 16 cottahs of mulberry lands. The condition of the soil was very poor, but has been improved at a cost of Rs. 1,000 by digging broad drains, partly to run off the rain water and partly to raise the level of the mulberry lands. Completion of this work will require about Rs. 2,000 more. During the year under review 5 bighas of old deshi mulberry was replaced by new mulberry cuttings, 2 bighas of this were replanted with the selected variety and 2 bighas with good deshi mulberry.

EXCHANGE OF SEED BETWEEN THE NURSERIES.

As usual Piasbari Central Nursery supplied Nistari seed-cocoons to all other central nurseries according to their requisitions and Mirganj Central Nursery had done the same in turn to Piasbari and Amriti Central Nurseries.

The Bogra nursery which used to keep-up Chhotopoloo seed was transferred to Kaitha Central Nursery last year.

A nursery for Chhotopoloo was established in Darjeeling in 1919, and the seed so produced in a cool climate afterwards gave excellent results in the plain at Mirganj and Kumarpur Central Nurseries. The percentage of Pebrine in the seed as issued from Darjeeling was only half a per cent.

For the next year, it has been arranged to supply Chhotopoloo seed only from Darjeeling nursery.

The average production from Government nurseries seed are always most successful, giving an outturn of 100 to 120 kahons from one kahon of seed.

Supply of pure and disease-free Nistari and Chhotopoloo seed to the professional rearers.

The total receipts from sales of good cocoons at Government nurseries from 1st April 1919 to 31st March 1920 were as follows :—

K.	P.	G.			Rs.	A.	P.
From 20,122	9	11	Seed-cocoons	... ...	81,622	3	6
,, 931	15	10	Cocoons	... ...	1,197	12	0
From miscellaneous production				... ...	1,365	11	2
				Total ...	84,185	10	8

The figures of sale-proceeds for the four previous years are as follows :—

	Rs.	A.	P.
1915-16	16,828	8	4
1916-17	28,737	3	10
1917-18 (from 1st July 1917 to 31st March 1918) ...	32,562	9	6
1918-19	62,358	2	9
1919-20	84,185	10	8

In comparison with the last four years' figures given above, it will be seen that there has been a continual increase both in revenue and in production of good seed. The increase is a general one and is shared by all nurseries.

Details of sale-proceeds of each central nursery during the year commencing from 1st April 1919 to 31st March 1920 are shown below :—

Name of nurseries.	Seed.			Cocoons.			Miscellaneous.			Total sale-proceeds.		
	K.	P.	G.	K.	P.	G.	Rs.	A.	P.	Rs.	A.	P.
Piasbari Nursery ...	6,014	4	3	100	12	10	377	8	11	26,733	6	11
Amriti ,, ...	4,561	0	0	224	4	0	250	8	3	21,436	15	9
Kumarpur ,, ...	3,088	8	0	129	4	0	122	5	9	10,561	15	6
Chandanpur ,, ...	2,749	1	2	282	10	10	159	15	9	10,091	10	6
Kalitha ,, ...	1,848	8	1	108	15	10	98	5	6	7,213	11	3
Mirganj ,, ...	1,861	4	5	85	4	0	64	1	0	7,854	0	9
Sadar ,, ...	.....			0	13	0	292	14	0	293	14	0
Total ...	20,122	9	11	931	15	10	1,365	11	2	84,185	10	8

Total expenditure of the nurseries, including the office establishment from 1st April 1919 to 31st March 1920, is as follows :—

Details.	Amount. Rs.	A.	P.
Salary of the Superintendent of Sericulture, Bengal ...	6,000	0	0
Pay of the establishment	22,188	6	5
Travelling allowance of the Superintendent of Sericulture, Bengal	2,047	15	0
Travelling allowance of the establishment ...	5,131	8	6
Petty construction and repairs	10,074	7	9
Rewards to nursery men	440	0	0
Disinfection	2,905	11	0
Cultivation and rearing	59,895	14	9
Miscellaneous	12,962	7	3
Rates, rents and taxes	1,810	5	11
Total ...	1,23,456	12	7

Training of the sons of the Professional Rearers.

The principles of scientific methods of Sericulture were taught to the Professional Rearer's sons at Rajshahi Sericultural School whence ten students have successfully passed during the year under report.

The continuation of a lower primary school started last year at Piasbari for Sericultural lessons to the rearers' sons attending the school, has been sanctioned by Government.

Industrial exhibitions.

Sericultural operations were demonstrated at Suri and Calcutta exhibitions.

Co-operative Credit Societies.

During the year new banks were opened at Manikpur and Sadanandapur; also at Mehedipur (Malda). This makes a total of some rural banks all of which are under the supervision of adjacent nurseries, all of which excepting the Madanpur Rearer's Bank are doing well.

In collaboration with the officers of the Co-operative Department efforts are being made to increase the number of societies as far as possible.

Agricultural Loans.

It is interesting to note that the Collectors of Birbhum and Malda advanced loans to the respective amounts of Rs. 841 and Rs. 732 to poor rearers in the past year.

It is likely that this practice will increase considerably.

Statement showing the quantities and value of silk and silk manufactures exported from Calcutta to Foreign Countries during the year 1919-20, as compared with previous six years figures received from the office of the Collector of Customs, Calcutta.

	lbs.	Value. Rs.
1913-14	52,961	46,055
1914-15	28,903	2,09,920
1915-16	23,837	2,06,400
1916-17	70,467	8,18,306
1917-18	44,303	5,26,640
1918-19 (raw silk)	49,291	8,00,860
Do. (Chhusum)	173,283	2,13,740
Do. (Cocoons)	3,750	6,827
1919-20 (Raw silk)	21,494	3,07,010
Do. (Chhusum or waste)	322,932	3,40,580
Do. (Cocoons)	12,500	19,530

A. C. Ghosh,

Superintendent of Sericulture, Bengal.

APPENDIX XVI.

REPORT ON THE WORK DONE AT THE SERICULTURAL RESEARCH STATIONS (BERHAMPORE, KURSEONG AND KALIMPONG), DURING THE YEAR 1919-20.

Introduction.

The comparative statements showing the relative efficiency of the different silk-worm races reared on a field scale at the Berhampore Research station are enclosed with this report and numbered in continuation of the statements submitted in my last year's report. The following races are at present under field trial experiments :—

No. 1 Hybrid.—A hybrid derived from a cross between an accidental bivoltin and the multivoltin indigenous Nistari; at present at the 44th generation.

No. 4 Hybrid.—A hybrid derived from a cross between the multivoltin Madagascar and multivoltin indigenous Nistari at present at the 44th generation.

J. 303.—A hybrid race obtained from Miss M. L. Cleghorn and reared and selected here since March 1918; at present at the 77th generation.

For a comparative study of the statements it will be necessary to compare them with the figures submitted in previous years.

Village Tests.

In view of last year's test showing the best average for the year, the hybrid No. 1 is now being tried in two villages in order to determine the actual capacity of the race under village conditions. The races are reared under considerable disadvantage in the rearers' houses. The exact capacity of the race for production and general efficiency should be determined from the results under village conditions of rearing in well-organised institutions.

The figures for the last Agrahani (October—December 1920) crop for this hybrid No. 1 showed a greater yield of 40 per cent. in comparison to the yield of the indigenous race in the same village. The consumption of leaves in the case of the hybrid was 105 maunds against 100 maunds in the case of the Nistaris. But it is evident that the valuation of the yield far exceeds the cost incurred for the excess consumption of leaves which practically renders latter a negligible factor in consideration of the immense advantages derived through the greater percentage of outturn as also the yield of silk. This is just the beginning of this test and as such it would be better to wait till more crops were reared before making any definite observation on the subject.

Experimental work.

In addition to the field trial experiments all the hybrid lots and the indigenous races are being reared by families and subjected to the strictest method of selection. Several new experiments on hybridisation as well as on the acclimatisation of the superior foreign breeds are under test at present. The hill stations at Kurseong and Kalimpong are being used for the rearing of the different silk-worm races during March to October in order to avoid the effects of degeneration. This period is very unfavourable to proper rearing in the plains and the effects are highly pronounced even on the indigenous races which show a considerable fall in their yield of silk in comparison to their yield during the normal period from October to March.

Sericultural School.

The school attached to the Berhampore Research Station had six stipend-holders selected from the rearing classes during the last session. Five students who had passed the school Final Examination were awarded the sanctioned reward of Rs. 250 each for the construction of rearing houses according to the plan approved by the Department.

P. C. CHOWDHURY,

Superintendent of Sericulture, Berhampore,
in charge Sericultural Research Station.

STATEMENT VI.

Data regarding different races of silkworms reared at the Berhampore Sericultural Research Station during October-December crop, 1918.

Name of race.	No. 1A, 34th generation.	No. 1B, 34th generation.	No. 4A, 34th generation.	No. 4B, 34th generation.	J. 303A, 67th generation.	J. 303B, 67th generation.	No. 5 Ramnagar.	Nistari.
seed-cocoons.	13-10-18	13-10-18	7-10-18	7-10-18	3-10-18	3-10-18	7-10-18	7-10-18
Date of cutting-out of moths.	23/24-10-18	23/25-10-18	15/17-10-18	14/16-10-18	13/14-10-18	12/14-10-18	15/17-10-18	17/18-10-18
Date of examination of moths.	28/31-10-18	28/31-10-18	22-10-18	23-10-18	18-10-18	17-10-18	21-10 18	24-10-18
Total number of moths	522	408	442	696	667	400	413	372
Number of dead moths rejected.	166	100	50	350	100	140	32	40
Total number of moths examined.	308	260	342	237	227	206	354	297
Number of moths rejected for Pebrine	24	20	29	17	27	43	45	62
Number of moths rejected for Flacherie	174	160	215	120	60	43	142	116
Number of disease-free moths.	110	80	100	100	160	120	167	131
Number of improperly laid layings rejected.	45	45	50	109	30	50	21	35
Number of layings rejected for univoltine tendencies.	3	3	Nil	Nil	3	4	6	Nil
Temperature during seed-cutting period.	81°F.	81°F.	81°F.	81°F.	81°F.	81°F.	81°F.	81°F.
Number of layings reared.	110	80	100	100	160	120	167	131
Average number of eggs per laying	380	350	365	372	335	330	312	300
Date of hatching ...	1/3-11-18	1/4-11-18	26/27-10-18	526/27-10-18	22/25-10-18	22/25-10-18	26/27-10-18	26/27-10-18
Date of spinning ...	30-11-18 to 1-12-18	1/2-12-18	23/25-11-18	21/23-11-18	13/15-11-18	14/15-11-18	21/23-11-18	23/24-11-18
Temperature during rearing.	78°5F.	74°5F.	74°5F.	78°5°F.	78°5°F.	74°5°F.	78°5°F.	74°5°F.
Total outturn of cocoons.	25k. 10p.	16k. 8p.	23k. 2p.	23k. 14p.	29k.	20k. 14p.	27k. 14p.	21k. 12p.
Disposal of outturn :—								
(a) Quantity kept for seed.	2k.	3k.	2k.	2k.	12p.	12p.	12p.	12p.
(b) Quantity kept for sample.	2 pons	2 pons	2 pons	2 pons	2 pons	2 pons	2 pons	2 pons
(c) Quantity kept for cocoons for reeling.	23k. 8p.	13k. 6p.	21k.	21k. 12p.	26k. 2p.	20k.	27k.	20k. 14p.
Total quantity of leaves used.	2,037 lbs.	1,487 lbs.	1,966 lbs.	1,961 lbs.	2,593 lbs.	1,721 lbs.	2,620 lbs.	1,875 lbs.
Quantity of leaves rejected [tender, too hard, dusty, etc.].	56 lbs.	87 lbs.	55 lbs.	64 lbs.	70 lbs.	20 lbs.	63 lbs.	56 lbs.
Quantity of leaves consumed.	1,981 lbs.	1,400 lbs.	1,911 lbs.	1,897 lbs.	2,523 lbs.	1,701 lbs.	2,557 lbs.	1,819 lbs.

STATEMENT VI—*concluded.*

Comparative figures for different races of silkworms reared at the Berhampore Sericultural Research Station during October-December crop, 1918.

Name of race.	No. 1A, 34th generation.	No. 1B, 34th generation.	No. 4A, 34th generation.	No. 4B, 34th generation.	J. 303A, 67th generation.	J. 303B, 67th generation.	No. 5 Ramnagar.	Nistari.
1. Mr. J. de Minvielle's reeling tests :—								
(*a*) Silk in 80 sicca ...	2 srs. 2½ ch.	1 sr. 2 ch.	2 srs. 2½ ch.	2 srs. 1 ch.	2 srs. 6 ch.	1 sr. 10 ch.	2 srs. 5 ch.	1 sr. 12 ch.
(*b*) Farai cocoons ...	21 k. 14 p.	14 k. 3 p.	20 k.	22 k. 5 p.	29 k. 12 p.	18 k. 5 p.	25 k. 13 p.	20 k.
(*c*) Kahan parta per seer in 80 sicca.	10 k. 2 p. 8¼ g.	12 k. 9p. 15½ g.	9k. 4P. 8g.	10 k. 13 p. 1¾ g.	12 k. 8 p. 8¼ g.	11 k. 4 p. 6 g.	12 k. 2p. 11¾ g.	11 k. 6 p. 17g.
(*d*) Chassam or floss ...	10 ch.	6 ch.	11 ch.	13 ch.	13 ch.	9 ch.	14 ch.	9½ ch.
2. Comparative estimation :—								
(*a*) Percentage of dead moths.	31·8	24·5	11·31	50·28	27·24	35	7·74	10·75
(*b*) Percentage of Pebrine.	7·79	7·69	7·89	7·17	11·91	20·27	11·58	20·37
(*c*) Percentage of Flacherie.	56·49	61·53	62·86	50·63	26·34	20·87	35·77	33
(*d*) Percentage of disease-free moths.	35·71	30·77	29·24	42·19	70·48	51·45	35	44·1
(*e*) Percentage of yield per laying.	78·46	75·42	81·09	78·7	69·25	67·47	68·47	73·83
(*f*) Number of layings yielding one kahan outturn.	4·29	4·84	4·32	4·37	5·51	5·74	5·99	6
(*g*) Leaves consumed per kahan outturn.	77·3 lbs.	80 lbs.	82·64 lbs.	82·92 lbs.	87 lbs.	81·48 lbs.	89·32 lbs.	83·63 lbs.
(*h*) Leaves required for cocoons to yield one seer reeled silk (calculated from Mr. de Minvielle's figures).	780 lbs.	1005 lbs.	763·25 lbs.	897 lbs.	1087·5 lbs.	916·65 lbs.	1082·9 lbs.	949·87 lbs.
(*i*) Number of cocoons weighing one seer on the 3rd day after spinning.	13 p. 12 g.	13 p.	12 p.	11 p. 18 g.	14 p.	1 k.	15 p. 8g.	15 p. 4 g.
(*j*) Average weight of one cocoon (with chrysalis) on the 3rd day after spinning (200 readings).	17·4 grs.	15 grs.	18·5 grs.	18 grs.	17 grs.	15 grs.	15 grs.	15 grs.
(*k*) Average weight of silky substance in one cocoon without chrysalis) on the 3rd day after spinning (200 readings).	2 grs.	2 grs.	2½ grs.	2½ grs.	2 grs.	1½ grs.	2 grs.	1½ grs.
3. Variational features observed :—								
(*a*) Larval markings ...	.....	.....	.....	.....	.....	.....	.....	.....
(*b*) Colour of cocoons ...	Yellow	Yellow	Yellow	Yellow	Yellow and white.	Yellow and white.	Yellowish	Yellow
(*c*) Any other features	.....	.....	.....	.....	.....	.....	.....	.....
Figures kindly supplied by Mr. N. McNamara, Kashmir, on silk yarns from August-September crop. — Average elasticity.	23·87	19·71	20·20	20·32	16·37	17·07	18·70	18·0
Figures kindly supplied by Mr. N. McNamara, Kashmir, on silk yarns from August-September crop. — Average tenacity.	86·50	86·68	68·0	68·93	60·58	54·0	47·81	89·50
4. Remarks	.....	.....	.....	.....	.....	.....	.....	.....

STATEMENT VII.

Data regarding different races of silkworms reared at the Berhampore Sericultural Research Station during March-April crop, 1919.

Name of race.	No. 1A, 36th generation.	No. 1B, 36th generation.	No. 4A, 36th generation.	No. 4B, 36th generation.	J. 403A, 63th generation.	J. 303B, 69th generation.	No. 5, Ramnagar.	Nistari.
1. Date of spinning of seed-cocoons.	15/16-2-19	15/16-2-19	4/5-2-19	4/5-2-19	26-1-19	29-1-19	30-1-19	6-2-19
2. Date of cutting-out of moths.	3/4-3-19	3/4-3-19	22/23-2-19	23/23-2-19	14/15-2-19	17/15-2-19	18/15-2-19	24-2-19
3. Date of examination of moths.	12-3-19	13-3-19	2-3-19	28-2-19 to 1-3-19	22/24-2-19	25-2-19	26-2-19	4-3-19
4. Total number of moths	1,070	1,001	638	509	1,199	233	235	439
5. Number of dead moths rejected.	468	622	259	183	834	97	129	163
6. Total number of moths examined.	352	337	345	293	309	101	112	142
7. Number of moths rejected for Pebrine.	26	24	16	16	22	8	8	13
8. Number of moths rejected for Flacherie.	96	80	97	48	41	12	26	26
9. Number of disease-free moths.	230	223	232	229	246	81	78	103
10. Number of improperly laid layings rejected.	90	52	34	18	56	35	14	22
11. Number of layings rejected for univoltine tendencies.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
12. Temperature during seed-cutting period.	69 F.	69° F.	69° F.	69° F.	69° F.	69° F.	69° F.	69° F.
13. Number of layings reared.	200	200	200	200	200	50	50	50
14. Average number of eggs per laying.	393	403	450	402	375	372	420	360
15. Date of hatching ...	14/16-3-19	14/16-3-19	7/9-3-19	7/9-3-19	2/5-3-19	5/7-3-19	5/7-3-19	9/10-3-19
16. Date of spinning ...	9/11-4-19	9/11-4-19	3/5-4-19	4/6-4-19	27-3-19 to 1-4-19	31-3-19 to 2-4-19	31-3-19 to 3-4-19	4/5-4-19
17. Temperature during rearing.	83° F.	83° F.	83° F.	83° F.	78·5° F.	78·5° F.	78·5 F.	78·5° F.
18. Total outturn of cocoons.	38k. 6p. 8g.	36k. 6p. 6g.	49k. 5p. 5g.	36k. 3p. 12g.	29k. 6p.	8k. 7p.	9k. 3p.	11k. 5p. 10g.
19. Disposal of outturn :—								
(a) Quantity kept for seed.	1k. 4p.	1k. 4p.	1k. 4p.	1k. 4p.	1k. 4k.	8p.	8p.	8p.
(b) Quantity kept for sample.	2 pons	2 pons	2 pons	2 pons	2 pons	2 pons	2 pons	2 pons
(c) Quantity kept for cocoons for reeling.	37k. 0P. 8g.	35k. 0p. 8g.	47k. 15p. 5g.	34k. 13p. 12g.	28k.	7k. 13p.	8k, 9p.	10k. 11P. 10g.
20. Total quantity of leaves used.	3,164 lbs.	2,859 lbs.	2,854 lbs.	3,016 lbs.	2,732	698 lbs.	798 lbs.	1,052 lbs.
21. Quantity of leaves rejected [tender, too hard, dusty, etc.].	64 lbs.	60 lbs.	58 lbs.	71 lbs.	140 lbs.	42 lbs.	50 lbs.	52 lbs
22. Quantity of leaves consumed.	3,100 lbs.	2,799 lbs.	2,796 lbs.	2,945 lbs.	2,592 lbs.	656 lbs.	748 lbs.	1,000 lbs.

STATEMENT VII—*concluded.*

Comparative figures for different races of silkworms reared at the Berhampore Sericultural Research Station during March-April crop, 1919.

Name of race.	No. IA, 36th generation.	No. IB, 36th generation.	No. 4A, 36th generation.	No. 4B, 36th generation.	J. 303A, 69th generation.	J. 303B, 69th generation.	No. 5 Ramnagar.	Nistari.
1. Mr. J. de Minvielle's reeling tests :—								
(*a*) Silk in 80 sicca ...	3 srs. 3 ch.	2 srs. 12½ ch.	4 sr. 3½ ch.	3 srs.	2 srs. 6 ch.	10½ ch.	10 ch.	13 ch.
(*b*) Farai cocoons ...	37 k. 8g.	35 k. 6g.	47 k. 15 p. 5 g.	34 k. 13 p. 12 g.	28 k.	7 k. 13 p.	8 k. 9 p.	10 k. 11 p. 10 g.
(*c*) Kahan parta per seer in 80 sicca.	11 k. 9 p. 7g.	12 k. 9 p. 7 g.	11 k. 5 p. 17¼ g.	11 k. 9 p. 17¼ g.	11 k. 12 p. 12½ g.	11 k. 14 p. 9½ g.	13 k. 11 p. 4 g.	13 k. 3 p. 1½ g
(*d*) Chassam or floss ...	.....	.....	.....	.....	.....	.....	.....	.....
2. Comparative estimation :—								
(*a*) Percentage of dead moths.	43·73	62·13	40·59	36·93	61·21	41·81	50·58	49·84
(*b*) Percentage of Pebrine.	7·38	7·12	4·63	5·46	7·11	7·92	7·14	9·17
(*c*) Percentage of Flacherie.	27·27	23·73	28·11	16·38	14·26	11·88	23·21	18·3
(*d*) Percentage of disease-free moths.	65·34	69·13	67·24	78·15	79·61	80·19	69·64	72·53
(*e*) Percentage of yield per laying.	62·53	57 79	70·15	57·69	45·	58·	56·	80·66
(*f*) Number of layings yielding one kahan outturn.	4·77	5·49	4·	6·15	6·8	5·92	5·44	4·4
(*g*) Leaves consumed per kahon outturn.	80·72 lbs.	76·9 lbs.	56·6 lbs.	81·29 lbs.	88 28 lbs.	77·74 lbs.	81·41 lbs.	88·15 lbs.
(*h*) Leaves required for cocoons to yield one seer reeled silk (calculated from Mr. de Minvielle's figures).	937·61 lbs.	968·21 lbs.	844·24 lbs.	941·16 lbs.	040·73 lbs.	923·16 lbs.	1,115·31 lbs.	1,162· lbs.
(*i*) Number of cocoons weighing one seer on the 3rd day afte spinning.	13 p. 11 g.	13 p. 11 g.	13 p. 5 g.	13 p. 6 g.	14 p.	13 p. 18 g.	13 p.	13 p. 4g.
(*j*) Average weight of one cocoon (with chrysalis) on the 3rd day after spinning (200 readings).	15 grs.	15·32 grs.	16·25 grs.	16·8 grs.	12·8 grs.	15·2 grs.	14·44 grs.	13·78 grs.
(*k*) Average weight of silky substance in one cocoon (without chrysalis) on the 3rd day after spinning (200 readings).	1·72 grs.	1·85 grs.	2·12 grs.	2·17 grs.	1·65 grs.	1·72 grs.	1·85 grs.	1·7 grs.
3. Variational features observed :—								
(*a*) Larval markings ...	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
(*b*) Colour of cocoons ...	Yellow	Yellow	Yellow	Yellow	Yellow and white.	Yellow and white.	Yellowish	Yellow
(*c*) Any other features...	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
4. Remarks	In some of the cases the poor results are due to the cocoons being weather affected or "Gazia." The weather was quite cloudy with occasional rains on the 4th to 6th April and again from 9th to 13th.							

STATEMENT VIII.

Data regarding different races of silkworms reared at the Berhampore Sericultural Research Station during April-May crop, 1919.

Name or race.	No. 1A, 37th generation.	No. 1B. 37th generation.	No. 4A, 37th generation.	No. 4B, 37th generation.	J. 303A, 70th generation.	Nistari.	Chotopolu.
Date of spinning of seed-cocoons.	3-4-19	3-4-19	3-4-19	3-4-19	30-3-19	4-4-19	10-4-19
Date of cutting-out of moths.	18-4-19	18-4-19	13-4-19	13-4-19	9-4-19	13-4-19	20-4-19
Date of examination of moths.	24/25-4-19	24/25-4-19	19-4-19	19-4-19	15/16-4-19	18-4-19	26-4-19
Total number of moths ...	428	351	186	190	330	65	75
Number of dead moths rejected.	170	100	31	34	86	4	11
Total number of moths examined.	245	231	145	140	220	54	52
Number of moths rejected for Pebrine.	15	12	9	7	35	4	3
Number of moths rejected for Flacherie.	96	101	22	25	73	18	19
Number of disease-free moths.	134	118	114	108	112	32	30
Number of improperly laid laying rejected.	13	20	10	16	24	7	12
Number of layings rejected for univoltine tendencies.	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Temperature during seed-cutting period.	84°F.	84°F.	83°F.	83°F.	83°F.	83°F.	84°F.
Number of layings reared.	100	100	100	100	100	25	25
Average number of eggs per laying.	436	412	475	450	405	425	358
Date of hatching ...	26/27-4-19	26/27-4-19	21/22-4-19	21/22-4-19	17/18-4-19	21/22-4-19	29/30-4-19
Date of spinning ...	14/15-5-19	14/15-5-19	14/15-5-19	14/15-5-19	8/11-5-19	12/13-5-19	24/27-5-19
Temperature during rearing.	87°F.	87°F.	87°F.	87°F.	87°F.	87°F.	87°F.
Total outturn of cocoons.	19k. 7p.	20k. 12p.	26k. 13p.	20k. 8p.	17k. 14p. 18g.	5k. 10p.	4k. 3p.
Disposal of outturn :—							
(a) Quantity kept for seed.	1k.	1k.	1k.	1k.	1k.	8p.	8p
(b) Quantity kept for sample.	2 pons	2 pons	2 pons	2 pons	2 pons	2 pons	2 pons
(c) Quantity kept for cocoons for reeling.	18k. 5p.	19k. 10p.	25k. 11p.	19k. 6p.	16k. 12p. 18g.	5k.	3k. 9p
Total quantity of leaves used.	1,456 lbs.	1,685 lbs.	2,275 lbs.	1,758 lbs.	1,825 lbs.	493 lbs.	462 lbs.
Quantity of leaves rejected [tender, too hard, dusty, etc.].	84 lbs.	88 lbs.	224 lbs.	200 lbs.	220 lbs.	69 lbs.	43 lbs.
Quantity of leaves consumed.	1,372 lbs.	1,597 lbs.	2,051 lbs.	1,558 lbs.	1,605 lbs.	431 lbs.	419 lbs.

STATEMENT VIII—*concluded.*

Comparative figures for different races of silkworms reared at the Berhampore Sericultural Research Station during April-May crop, 1919.

Name of race.	No. 1A, 37th generation.	No. 1B, 37th generation.	No. 4A, 37th generation.	No. 4B, 37th generation.	J. 303A, 70th generation.	Nistari.	Chotopolu.
1. Mr. J. de Minvielle's reeling tests :—							
(*a*) Silk in 80 Sicca ...	1 sr. 14 ch.	2 srs. 5 ch.	3 srs. 1 ch.	2 srs. 5 ch.	1 sr. 10 ch.	$8\frac{1}{4}$ ch.	$8\frac{3}{4}$ ch.
(*b*) Farai cocoons ...	18 k. 5p.	19 k. 10 p.	25 k. 11 p.	19 k. 6 p.	16 k. 12 p. 18g.	5 k.	3 k. 9 p.
(*c*) Kahan parta per seer in 80 sicca.	9 k. 12 p. $5\frac{1}{4}$ g.	8 k. 7 p. $15\frac{3}{4}$ g.	8 k. 6 p. 4 g.	8 k. 6 p. 1 g.	10 k. 5 p. $9\frac{1}{4}$ g.	9. k 11p. 3 g.	12 k.
(*d*) Chassam or floss ...	.....	.....	.....	.....	.....	.....	.....
2. Comparative estimation :—							
(*a*) Percentage of dead moths.	39·71	28·49	16·77	17·89	26	6·15	14·66
(*b*) Percentage of Pebrine.	5·3	5·15	6·2	5·	15·9	7·4	5·76
(*c*) Percentage of Flacherie.	39·18	43·72	15·17	17·85	33·18	33·33	36·53
(*d*) Percentage of disease-free moths.	54·69	51	78·62	77·14	50·9	59·25	57·69
(*e*) Percentage of yield per laying.	67	63·98	72 25	68·31	56·67	67·76	59·88
(*f*) Number of layings yielding one kahan outturn.	5·14	4·81	3·72	4·87	5·38	4·44	5·97
(*g*) Leaves consumed per kahan outturn.	72 lbs.	79 lbs.	76 lbs.	78 lbs.	89 lbs.	79 lbs.	100 lbs.
(*h*) Leaves required for cocoons to yield one seer reeled silk (calculated from Mr. de Minvielle's figures).	1706·72 lbs.	658· lbs.	637·45 lbs.	634·36 lbs.	920·38 lbs.	766 lbs.	1200 lbs.
(*i*) Number of cocoons weighing one seer on the 3rd day after spinning.	13p. 14g.	13p. 3g.	12 p. 18 g.	12 p. 12 g.	14 p. 18 g.	14 p. 12 g.	15 p.
(*j*) Average weight of one cocoon (with chrysalis) on the 3rd day after spinning (200 readings).	15 grs.	15·98 grs.	14·34 grs.	14 grs.	11 grs.	12·5 grs.	11 grs.
(*k*) Average weight of silky substance in one cocoon (without chrysalis) on the 3rd day after spinning (200 readings).	2 grs.	2·1 grs.	2·25 grs.	2·25 grs.	1·75 grs.	1·5 grs.	1·45 grs.
3. Variational features observed :—							
(*a*) Larval markings ...	.....	.....	.....	.....	.....	.....	.....
(*b*) Colour of cocoons ...	Yellow	Yellow	Yellow	Yellow	White and yellow.	Yellow	Yellow
(*c*) Any other features ...	.....	.....	.....	.....	.....	.....	.....
4. Remarks	.....	.....	.....	.....	.....	.....	.....

STATEMENT IX.

Data regarding different races of silkworms reared at the Berhampore Sericultural Research Station during June crop, 1919.

	Name of race.	No. 1, 38th generation.	No. 4, 38th generation.	J. 303, 71st generation.	Nistari.	Chotopolu.
1.	Date of spinning of seed-cocoons.	10/19-5-19	9/14-5-19	9/10-5-19	15-5-19	23-5-19
2.	Date of cutting-out of moths.	18/28-5-19	19/24-5-19	18/20-5-19	24-5-19	1/2-6-19
3.	Date of examination of moths.	25-5-19 to 3-6-19	25/30-5-19	25/26-5-19	30-5-19	7/8-6-19
4.	Total number of moths.	1,329	1,396	752	230	272
5.	Number of dead moths rejected.	477	472	289	62	79
6.	Total number of moths examined.	837	907	439	158	176
7.	Number of moths rejected for Pebrine.	43	58	32	12	15
8.	Number of moths rejected for Flacherie.	474	480	232	86	100
9.	Number of disease-free moths.	320	369	175	60	61
10.	Number of improperly laid layings rejected.	15	17	24	10	17
11.	Number of layings rejected for univoltine tendencies.	Nil	Nil	Nil	Nil	Nil
12.	Temperature during seed-cutting period.	84° f.	84° f.	84° f.	84° f.	84° f.
13.	Number of layings reared.	300	395	175	50	50
14.	Average number of eggs per laying.	342	342	328	302	289
15.	Date of hatching ...	26-5-19 to 6-6-19	27-5-19 to 1-6-19	26/28-5-19	1/2-6-19	9/10-6-19
16.	Date of spinning ...	18/26-6-19	14/21-6-19	12/15-6-19	20/22-6-19	29-6-19 to 1-7-19
17.	Temperature during rearing.	85·5° F.	85·5° F.	85·5° F.	85·5° F.	85·5° F.
18.	Total outturn of cocoons.	55 k. 2 p.	78 k. 10 p.	27 k. 6 p.	8 k. 4 p.	7 k. 10 p.
19.	Disposal of outturn :—					
	(*a*) Quantity kept for seed.	12 k.	6 k.	2 k. 4 p.	2 k.	2 k.
	(*b*) Quantity kept for sample.	2 pons	2 pons	2 pons	2 pons	2 pons
	(*c*) Quantity kept for cocoons for reeling.	43 k.	72 k. 8 p.	25 k.	6 k. 2 p.	5 k. 8 p.
20.	Total quantity of leaves used.	5,898 lbs.	7,554 lbs.	3,269 lbs.	911 lbs.	883 lbs.
21.	Quantity of leaves rejected [tender, too hard, dusty, &c.].	420 lbs.	600 lbs.	220 lbs.	86 lbs.	80 lbs.
22.	Quantity of leaves consumed.	5,478 lbs.	6,954 lbs.	3,049 lbs.	825 lbs.	803 lbs.

STATEMENT IX—*concluded.*

Comparative figures for different races of silkworms reared at the Berhampore Sericultural Research Station during June crop, 1919.

Name of race.	No. 1, 38th generation.	No. 4, 38th generation.	J. 303, 71st generation.	Nistari.	Chotopolu.
1. Mr. J. de Minvielle's reeling tests :—					
(*a*) Silk in 80 sicca ...	**3 sr. 1 ch.**	**5 sr. 4 ch.**	**1 sr. 10½ ch.**	**6 ch.**	**4½ ch.**
(*b*) Farai cocoons ...	43 k.	72 k. 8 p.	25 k.	6 k. 2 p.	5 k. 8 p.
(*c*) Kahan parta per seer in 80 sicca.	**14 k. 13 p.**	**13k. 12p. 19g.**	**15k. 1p. 10¼ g.**	**16k. 5p. 6½ g.**	**19k. 8p. 18g.**
(*d*) Chassam or floss ...	.....	.....	.. ...	.....	... ..
2. Comparative estimation :—					
(*a*) Percentage of dead moths.	**35·5**	**33·8**	**38·4**	**26·9**	**29**
(*b*) Percentage of Pebrine.	5·1	6·3	7·28	7·5	8·5
(*c*) Percentage of Flacherie.	**56·6**	**52·9**	**52·84**	**54·4**	**56·7**
(*d*) Percentage of Disease-free moths.	38·2	40·6	39·8	37·9	34·6
(*e*) Percentage of yield per laying.	**68·77**	**74·49**	**63·48**	**69·93**	**67·54**
(*f*) No. of layings yielding one kahan outturn.	5·44	5	6·39	6	6·55
(*g*) Leave consumed per kahan outturn.	**99·57 lbs.**	**88·44 lbs.**	**111·37 lbs.**	**100 lbs.**	**105·24 lbs.**
(*h*) Leaves required for cocoons to yield one seer reeled silk calculated from Mr. de Minvielle's figures).	1,398 lbs.	1,221·3 lbs.	1,681 lbs.	1,633·28 lbs.	2,058 lbs.
(*i*) Number of coccoons weighing one seer on the 3rd day after spinning.	**10 p. 17 g.**	**10 p. 10 g.**	**12 p. 15 g.**	**12 p.**	**14 p.**
(*j*) Average weight of one cocoon (with chrysalis) on the 3rd day after spinning (200 readings).	16·96 grs.	16·96 grs.	15·28 grs.	16·5 grs.	14 5 grs.
(*k*) Average weight of silky substance in one cocoon (without chrysalis) on the 3rd day after spinning (200 readings).	**2 grs.**	**2 grs.**	**1·35 grs.**	**1·75 grs.**	**1·5 grs.**
3. Variational features observed :—					
(*a*) Larval markings ...	.....	.....	.....	.....	.....
(*b*) Colour of cocoons ...	**Yellow**	**Yellow**	**Yellow and white.**	**Yellow**	**Yellow.**
(*c*) Any other features...	.....	.....	.....	.....	.....
4. Remarks	.....	.....	.....	.....	.....

STATEMENT X

Data regarding different races of silkworms reared at the Berhampore Sericultural Research Station during July crop, 1919.

Name of Race.	No. 1, 39th generation.	No. 4, 39th generation.	J. 303 72nd generation.	Nistari.	Chotapolu.
1. Date of spinning of seed-cocoons.	25-6-19	21-6-19	15-6-19	21-6-19	2-7-19
2. Date of cutting-out of moths.	4/5-7-19	30-6-19 to 1-7-19	24/25-6-19	30-6-19 to 1-7-19	12/13-7-19
3. Date of examination of moths.	9-7-19	4-7-19	29-6-19	4-7-19	17-7-19
4. Total number of moths	1,306	1,240	564	655	515
5. Number of dead moths rejected	609	441	143	232	153
6. Total number of moths examined.	682	783	401	396	327
7. Number of moths rejected for Pebrine.	49	69	31	26	37
8. Number of moths rejected for Flacherie.	228	387	180	178	115
9. No. of disease-free moths.	405	327	190	192	175
10. No. of improperly laid layings rejected.	15	16	20	27	35
11. No. of layings rejected for univoltine tendencies.	Nil	Nil	Nil	Nil	Nil
12. Temperature during seed-cutting period.	82°F.	82°F.	82°F.	82°F.	82°F.
13. Number of layings reared.	300	300	150	150	150
14. Average number of eggs per laying.	356	350	328	300	284
15. Date of hatching ..	12-7-19	8/9-7-19	2/3-7-19	8/9-7-19	20-7-19
16. Date of Spinning ...	2-8-19	27/29-7-19	18/20-7-19	27/29-7-19	12-8-19
17. Temperature during rearing.	84·F.	84·F.	84·F.	84·F.	84·F.
18. Total outturn of cocoons.	53 k.	50 k. 12 p.	21 k.	21 k. 3 p.	9 k. 12 p.
19. Disposal of outturn :—					
(*a*). Quantity kept for seed.	2 k. 12 p.	2 k. 8 p.	1 k.	1 k. 4 p.	1 k. 6 p.
(*b*). Quantity kept for sample.	4 pons	4 pons	2 pons	2 pons	2 pons
(*c*). Quantity kept for cocoons for reeling.	50 k.	48 k.	19 k. 14 p.	19 k. 13 p.	8 k. 4 p.
20. Total quantity of leaves used.	7,014 lbs.	6,611 lbs.	3,192 lbs.	3,001 lbs.	2,839 lbs.
21. Quantity of leaves rejected [tender, too hard, dusty, &c.].	416 lbs.	795 lbs.	323 lbs.	329 lbs.	217 lbs.
22. Quantity of leaves consumed.	6,598 lbs.	5,816 lbs.	2,869 lbs.	2,672 lbs.	2,622 lbs.

STATEMENT X—*concluded.*

Comparative figures for different races of silkworms reared at the Berhampore Sericultural Research Station during July crop, 1919.

Name of race.	No. 1, 39th generation.	No. 4, 39th generation.	J. 303, 72nd generation.	Nistari.	Chotopolu.
1. Mr. J. de Minvielles' reeling tests :—					
(*a*) Silk in 80 sicca ...	**3 srs. 15 ch.**	**4 srs.**	**1 sr. 3 ch.**	**1 sr. 9 ch.**	**8 ch.**
(*b*) Farai cocoons ...	50 k.	48 k.	19 k. 14 p.	19 k. 13 p.	8 k. 4 p.
(*c*) Kahan parta per seer in 80 sicca.	**12 k. 11 p. $3\frac{1}{2}$ g.**	**12 k.**	**16 k. 11 p. $15\frac{3}{4}$ g.**	**12 k. 10 p. $17\frac{1}{4}$ g.**	**16 k. 8 p.**
(*d*) Chassam or floss ...	1 sr. 12 ch.	1 sr. 14 ch.	12 ch.	11 ch.	$5\frac{1}{2}$ ch.
2. Comparative estimation :—					
(*a*) Percentage of dead moths.	**46·63**	**35·56**	**25·35**	**35·41**	**29·7**
(*b*) Percentage of Pebrine.	7·18	8·78	7·73	6·56	11·31
(*c*) Percentage of Flacherie.	**33·43**	**49·68**	**44·88**	**44·94**	**35·16**
(*d*) Percentage disease-free moths.	59·38	41·76	47·38	48·48	53·51
(*e*) Percentage of yield per laying.	**63·52**	**61·86**	**54·63**	**60·26**	**29·2**
(*f*) No. of layings yielding one kahan outturn	5·66	5·94	7·14	7	15·38
(*g*) Leaves consumed per kahan outturn.	**124·48 lbs.**	**114·6 lbs.**	**136·61 lbs.**	**126·11 lbs.**	**268·9 lbs.**
(*h*) Leaves required for cocoons to yield one seer reeled silk (calculated from Mr. de Minvielle's figures).	1,508·73 lbs.	1,375·2 lbs.	2286·4 lbs.	1,599 lbs.	4,436·85 lbs.
(*i*) Number of cocoons weighing one seer on the 3rd day after spinning.	**11 p. 4 g.**	**13 p. 8 g.**	**14 p. 8 g.**	**13 p. 10 g.**	**14 p.**
(*j*) Average weight of one cocoon (with chrysalis) on the 3rd day after spinning (200 readings.)	16·38 grs.	15 grs.	12·5 grs.	14·96 grs.	13·32 grs.
(*k*) Average weight of silky substance in one cocoon (without chrysalis) on the 3rd day after spinning (200 readings).	**2·4 grs.**	**2·55 grs.**	**1·8 grs.**	**2·6 grs.**	**2 grs.**
3. Variational features observed :—					
(*a*) Larval markings ...	.....	.....	.....	.....	.....
(*b*) Colour of cocoons ..	.....	.....	.....	.....	.....
(*c*) Any other features...	.....	.....	.....	.....	.....
4. Remarks	.....	.....	.....	... ..	.....

STATEMENT XI.

Data regarding different races of silkworms reared at the Berhampore Sericultu Research Station during August crop, 1919.

Name of race.	No. 1, 40th generation.	No. 4, 40th generation.	J. 303, 73rd generation.	Nistari.
1. Date of spinning of seed-cocoons.	2-8-19	29-7-19	19-7-19	29-7-19
2. Date of cutting-out of moths.	$\frac{11}{1}$-8-19	$\frac{7}{8}$-8-19	$\frac{28}{29}$-7-19	$\frac{7}{8}$-8-19
3. Date of examination of moths.	$\frac{17}{18}$-8-19	$\frac{13}{14}$-8-19	4-8-19	$\frac{13}{14}$-8-19
4. Total number of moths ...	919	1.426	459	666
5. Number of dead moths rejected.	520	816	189	405
6. Total number of moths examined.	387	593	250	239
7. Number of moths rejected for Pebrine.	41	65	35	57
8. Number of moths rejected for Flacherie.	158	282	98	71
9. Number of disease-free moths.	188	246	117	111
10. Number of improperly laid layings rejected.	12	17	20	22
11. Number of layings rejected for univoltine tendencies.	...	...	...	...
12. Temperature during seed-cutting period.	83° f.	83° f.	83° f.	83° f.
13. Number of layings reared	188	200	100	100
14. Average number of eggs per laying.	252	262	290	291
15. Date of hatching ...	$\frac{19}{20}$-8-19	$\frac{15}{16}$-8-19	$\frac{5}{6}$-8-19	$\frac{15}{16}$-8-19
16. Date of spinning ...	$\frac{7}{9}$-9-19	$\frac{3}{5}$-9-19	$\frac{23}{25}$-8-19	$\frac{3}{5}$-9-19
17. Temperature during rearing.	84° F.	84° F.	85° F.	84° F.
18. Total outturn of cocoons	24 k. 6 p.	34k. 15p. 13g.	13k. 5p.	14k. 8p. 10g.
19. Disposal of outturn :—				
(*a*) Quantity kept for seed.	2k. 8p.	2k. 8p.	1k. 4p.	1k. 4p.
(*b*) Quantity kept for sample.	2 pons	2 pons	2 pons	2 pons
(*c*) Quantity kept for cocoons for reeling.	21k. 12p.	32k. 5p. 13g.	11k. 15p.	13k- 2p. 10g.
20. Total quantity of leaves used.	3,760 lbs.	4,080 lbs.	1,490 lbs.	1,600 lbs.
21. Quantity of leaves rejected [tender, too hard, dusty, etc.].	150 lbs.	160 lbs.	50 lbs.	62 lbs.
22. Quantity of leaves consumed.	3,610 lbs.	3,920 lbs.	1,440 lbs.	1,538 lbs.

STATEMENT XI—*concluded.*

Comparative figures for different races of silkworms reared at the Berhampore Sericultural Research Station during August crop, 1919.

Name of race.	No. 1, 40th generation.	No. 4, 40th generation.	J. 303, 73rd generation.	Nistari.
1. Mr. J. de Minvielle's reeling tests :—				
(*a*) Silk in 80 sicca ...	**1 sr. 15 ch.**	**1 sr. 15 ch.**	**12 ch.**	**11 ch.**
(*b*) Farai cocoons ...	21 k. 12p.	32 k. 5 p. 13 g.	11 k. 15 p.	13 k. 2 p. 10 g.
(*c*) Kahan parta per seer in 80 sicca.	**11k. 3p. 12 g.**	**16 k. 11 p. 3½ g.**	**15 k. 14 p. 15¼ g.**	**19 k. 2 p. 3½ g.**
(*d*) Chassam or floss ...	14½ ch.	1 sr. 9½ ch.	8 ch.	8 ch.
2. Comparative estimation :—				
(*a*) Percentage of dead moths.	**56·58**	**57·22**	**41·17**	**60·81**
(*b*) Percentage of Pebrine	10·59	10·96	14·	23·84
(*c*) „ of Flacherie	**40·82**	**47·55**	**35·2**	**29·7**
(*d*) „ of disease-free moths.	48·	41·48	46·8	46·44
(*e*) Percentage of yield per laying.	**73·96**	**85·44**	**58·75**	**62·54**
(*f*) No. of layings yielding one kahan outturn.	7·59	5·71	7·51	6·88
(*g*) Leaves consumed per kahan outturn.	**148·1 lbs.**	**112 lbs.**	**108·16 lbs.**	**105·81 lbs.**
(*h*) Leaves required for cocoons to yield one seer reeled silk (calculated from Mr. de Minvielle's figures).	1,662·53 lbs.	1,870·22 lbs.	1,722·1 lbs.	2,024·77 lbs.
(*i*) Number of cocoons weighing one seer on the 3rd day after spinning.	**10 p. 5 g.**	**10 p. 10 g.**	**14 p.**	**12 p.**
(*j*) Average weight of one cocoon (with chrysalis) on the 3rd day after spinning (200 readings).	13·26 grs.	14·44 grs.	12·5 grs.	12·6 grs.
(*k*) Average weight of silky substance in one cocoon (without chrysalis) on the 3rd day after spinning (200 readings).	**2·6 grs**	**2·55 grs.**	**1·75 grs.**	**2 grs.**
3. Variational features observed :—				
(*a*) Larval markings ...	.....	.....	.....	.....
(*b*) Colour of cocoons ...	**Yellow** ...	**Yellow** ...	**Mixed white and yellow.**	**Yellow.**
(*c*) Any other features ...	.....	.....	.....	.....
4. Remarks	.....	Worms spun on rainy day and the cocoons were all weather affected.	.....	Worms spun on rainy day and the cocoons were all weather affected.

STATEMENT XII.

Data regarding different races of silkworms reared at the Berhampore Sericultural Research Station during October-December crop, 1919.

Name of race.	No. 1, 42nd generation.	No. 4, 42nd generation.	J. 303, 75th generation.	Nistari.
1. Date of spinning of seed-cocoons.	17-10-19	13-10-19	28-9-19	13-10-19
2. Date of cutting-out of moths.	27-10-19	23-10-19	$\frac{7}{8}$-10-19	23-10-19
3. Date of examination of moths.	2-11-19	29-10-19	$\frac{13}{14}$-10-19	29-10-19
4. Total number of moths	1,868	2,241	1,140	1,150
5. Number of dead moths rejected.	296	669	401	321
6. Total number of moths examined.	1,550	1,542	711	803
7. Number of moths rejected for Pebrine.	82	157	72	92
8. Number of moths rejected for Flacherie.	818	755	339	387
9. Number of disease-free moths.	650	630	300	324
10. Number of improperly laid layings rejected.	22	26	28	26
11. Number of layings rejected for univoltine tendencies.	Nil	Nil	Nil	Nil
12. Temperature during seed-cutting period.	75°F.	75°F.	84°F.	75°F.
13. Number of layings reared	360	600	300	300
14. Average number of eggs per laying.	330	341	328	325
15. Date of batching ...	$\frac{6}{7}$-11-19	$\frac{1}{2}$-11-19	$\frac{15}{16}$-10-19	$\frac{1}{2}$-11-19
16. Date of spinning ...	$\frac{2}{5}$-12-19	$\frac{26}{29}$-11-19	$\frac{3}{5}$-11-19	$\frac{26}{29}$-11-19
17. Temperature during rearing.	73°F.	73°F.	78°F.	73°F.
18. Total outturn of cocoons	74 k. 13 p.	88 k. 15 p.	33 k. 2 p.	41 k. 8p.
19. Disposal of outturn—				
(*a*) Quantity kept for seed.	4 k.	4 k.	1 k.	1 k.
(*b*) Quantity kept for sample.	2 pons	2 pons	2 pons	2 pons
(*c*) Quantity kept for cocoons for reeling.	70 k. 11 p.	84 k. 13 p.	32 k.	40 k. 6 p.
20. Total quantity of leaves used.	9,500 lbs.	11,716 lbs.	4,000 lbs.	4,696 lbs.
21. Quantity of leaves rejected [tender, too hard, dusty, etc.].	575 lbs.	644 lbs.	100 lbs.	250 lbs.
22. Quantity of leaves consumed.	8,925 lbs.	11,072 lbs.	3,900 lbs.	4,446 lbs.

STATEMENT XII.

Comparative figures for different races of silkworms reared at the Berhampore Sericultural Research Station during October-December crop, 1919.

Name of race.	No. 1, 42nd generation.	No. 4, 42nd generation.	J. 303, 75th generation.	Nistari.
1. Mr. J. de Minvielle's reeling tests :—				
(*a*) Silk in 80 sicca ...	**5 srs. 9¾ ch.**	**6 srs. 10¾ ch.**	**3 srs. 3 ch.**	**2 srs. 7¾ ch.**
(*b*) Farai cocoons ...	70 k. 11 p.	84 k. 13 p.	32 k.	40 k. 6 p.
(*c*) Kahan parta per seer in 80 sicca.	**12 k. 9 p. 5 g.**	**12 k. 9 p. 5 g.**	**10 k. 13 g.**	**13 k. 3 p. 3 g.**
(*d*) Chassam or floss ...	...	...	...	...
2. Comparative estimation :—				
(*a*) Percentage of dead moths.	**15·29**	**29·85**	**35·17**	**27·91**
(*b*) Percentage of Pebrine.	5·2	10·18	10·12	11·45
(*c*) Percentage of Flacherie.	**52·7**	**48·96**	**47·67**	**48·19**
(*d*) Percentage of disease-free moths.	41·93	40·85	42·19	40·34
(*e*) Percentage of yield per laying.	**48·3**	**55·64**	**43·**	**61·86**
(*f*) Number of layings yielding one kahan outturn.	5·5	6·74	9·	7·22
(*g*) Leaves consumed per kahan outturn.	**119·2 lbs.**	**124·49 lbs.**	**117·73 lbs.**	**107·13 lbs.**
(*h*) Leaves required for cocoons to yield one seer reeled silk (calculated from Mr. de Minvielle's figures).	1,499·31 lbs.	1,565·85 lbs.	1,178· lbs.	1,711·95 lbs.
(*i*) Number of cocoons weighing one seer on the 3rd day after spinning.	**10 pons**	**11 pons**	**11 pons**	**13 p. 10 g.**
(*j*) Average weight of one cocoon (with chrysalis) on the 3rd day after spinning (200 readings).	14·68 grs.	14·94 grs.	13·6 grs.	12 grs.
(*k*) Average weight of silky substance in one cocoon (without chrysalis) on the 3rd day after spinning (200 readings).	**2 grs.**	**2 grs.**	**1·5 grs.**	**1·75 grs.**
3. Variational features observed :—				
(*a*) Larval markings ...	...	...	...	...
(*b*) Colour of cocoons ...	**Yellow**	**Yellow**	**Yellow and white.**	**Yellow**
(*c*) Any other features ...	..	..	...	...
4. Remarks	...	...	...	...

APPENDIX XVII.

Report on Scientific work in connection with Sericulture done by Miss Cleghorn, F. L. S., F. E. S., F. Z. S., during the year 1919-20.

Pedigree Races of Silkworms.—The multivoltine hybrid race which was started in January 1911 is now in the 79th generation. It is the result of a cross between the many-brooded Indian Nistri and the one-brooded Italian-Japanese hybrid. In the 37th generation, which was the first to be reared on a large scale, some black worms appeared in family No. 303. As this family No. 303 was mutating it was reared quite apart and after a few generations their descendants were found to have given the best and most uniform results. They now form numerous groups, divided and subdivided into thousands of families. Table I gives the pedigree of the 303 hybrid race from the 69th generation in March 1919 to the 79th generation in March 1920. They are the descendants of families Nos. 182, 62, 20, 647, 147, 163, 110 and 888of the 69th generation (March 1919) recorded in the pedigree of race 303 given in last year's report. Table II gives the descent of the hot weather group of 303. This branch is descended from three families, Nos. 25, 21 and 30, which did exceedingly well during the great heat experienced in May and June 1919. So far they seem very promising and are being reared on a fairly large scale to enable a race to be formed from them which will be suitable for rearing during the hottest months in Bengal.

Most of the families producing a large number of cocoons have had a very small death rate ; but some with a small number of cocoons have also done well as the layings from which they hatched consisted of a fairly small number of eggs. In the July 1919 *élevage,* moth No. 71 produced 95 cocoo ns and No. 144 only 80, but their percentages of yield were 73 and 68, respectively, as No. 71 laid 129 eggs and No. 144 laid 116 eggs. Small layings often do well as the newly hatched worms are not so crowded as those of a large laying. A comparison of the vitality percentage with the number of eggs has shown that *in silkworms the highest vitality is not correlated with the highest fertility ;* so both vigour and fertility have to be included in selection.

The cocoons of the 303 race though small like those of all many-brooded races have been found when tested to yield the superior quality of silk technically known as 100-tavelle silk which only the best one-brooded races produce. Another valuable characteristic of this race is the comparatively large proportion of reelable silk contained in the cocoons.

A comparsion of the number of kahans (1 kahan=1,280 cocoons) required to produce one seer of silk with the average weight of the cocoons in the various races being tested at Berhampore is rather interesting. The comparative figures in cases where the number of kahans are about equal in number for the different races are quoted in the following table :—

Race.	Number of kahans yielding one seer of silk.	Average weight of cocoons.	Date of spinning.
	K. P. S.		
303	10 0 13 or 12,852 cocoons.	1·5 grs.	November 1919.
14	10 9 9½ or 13 558 ,,	2·9 ,,	June 1918.
Nistri ...	9 11 3 or 12,412 ,,	1·5 ,,	May 1919.
303	11 12 12½ or 15,090 ,,	1·65 ,,	March 1919.
1A ...	11 3 12¼ or 14,369 ,,	2·6 ,,	September 1919.
Nistri ...	11 6 17 or 14,628 ,,	1·5 ,,	November 1918.
,, ...	12 10 17½ or 16,230 ,,	2·6 ,,	July 1919.
1A ...	12 10 13¼ or 16,213 ,,	2·6 ,,	September 1918.
,, ...	12 11 3½ or 16,254 ,,	2·4 ,,	August 1919.
303	12 8 8¼ or 16,033 ,,	2·0 ,,	November 1918.
Nistri ...	15 11 3¼ or 20,093 ,,	2.0 ,,	September 1918.
1A ...	14 13 0 or 18,960 ,,	2·0 ,,	June 1919.
303	15 0 0 or 19,200 ,,	·82 ,,	May 1918.

The comparative figures for August 1919 of the different races being tested at Berhampore give the amounts of floss or waste silk as follows :—

In 303 race 20,381 cocoons give 1 seer of silk and 8 chitaks (½ seer) of floss.
In IA race 14,369 cocoons give 1 seer of silk and 14½ ch. (29-32 seer) of floss.
,, 4A ,, 21,374 ,, ,, 1 ,, ,, ,, 1 seer 9½ ch. (1$\frac{29}{32}$,,) ,,
Nistri ,, 24,494 ,, ,, 1 ,, ,, ,, 8 ch. (½ ,,) ,,

A comparison of the results obtained clearly shows that the cocoons of the 303 race produce comparatively a very large proportion of reelable silk. For 13,558 cocoons of IA race yield one seer of silk with an average weight of 2·9 grains while in the 303 race 12,852 cocoons yield one seer of silk with an average weight of 1·5 grains, 12,414 Nistri cocoons produce one seer of silk with an average weight of 1·5 too, but in the Nistri race the cocoons do not produce 100-tavelle silk, much valued commercially, but the inferior 40-tavelle.

Race 329, which is descended from moth No. 329 of the 38th generation, reared in December 1915 which lived twenty-two days, is being continued. It gives exceedingly good results during the rainy season and is now in the 74th generation.

The Ramnugger-Madagascar race reared at Alipore since 1917 is now in the 24th generation. It is practically quite multivoltine and produces small dull *carneo-giallo* cocoons with very little fluff and a fairly close grain characteristic of univoltine races. It would probably be found to produce 100-tavelle silk when tested. It does exceedingly well during the hot season but produces rather small cocoons.

Green worm race has been produced from a few albinos which appeared in a cross between the 303 and Mysore races. They are now in the 31st albino generation. On account of the absence of pigment the worms appear semi-transparent and green and the moths have white eyes instead of black. A cross has been made between this green worm race and a dark-banded mutation which appeared in the Ramnugger-Madagascar race. The results obtained from the second and successive generations of this cross are rather extraordinary. Three types appeared :—

(1) Normal worms spinning white cocoons moths with dark-banded wings and black eyes.
(2) Transparent amber-coloured worms spinning *yellow cocoons* moths with dark-banded wings and *white eyes*.
(3) Transparent green worms spinning pure-white cocoons. Moths with dark-bands on wings and white eyes.

These three types breed true and produce thick close grained cocoons.

Date of spinning good cocoons correspond each year.—It has been found on studying the records and pedigrees of the various races of silk worms that those which spin at about the same time each year give almost identical results. The favourable and unfavourable periods of the year for rearing vary in the different races although the races may have been reared side by side for years in the same rearing room. The 303 race reared at Alipore gives almost identical results at the same time every year. It gives good results in all rearings, except two rearings in the year, the worms of which spin during May and the first half of June and again from the middle of August to the middle of September. The Ramnugger-Madagascar race reared in the same room does very well in May and September, but not so well in June, August, January and February. There is a great similarity in the results obtained from each race at about the same time every year.

These rearings (kept up continuously, so that some worms are hatching and some spinning every week throughout the year) are valuable in showing the effects of the weather on the vigour of the worms and quality of the cocoons. The results of these experiments were not upset by the ravages of the silk worm fly which always chooses the most vigorous worms on which to lay its eggs, so the influence of the weather alone on the worms was clearly shown.

The approximate dates when the Nistri and Chotopolu races give good crops and a high percentage of yield are to be investigated during the present year.

Work on similar lines on mulberry will form an interesting series of experiments and is being carried out to see how some of the chief varieties bear cutting, and how the young shoots stand adverse seasonable changes during the year.

As it has been found that the production of good and poor crops of cocoons are so closely associated with favourable and unfavourable seasons in Bengal, only rearings, the worms of which would spin about the time of the year found to be always favourable to the production of a good crop, should be allowed, if cocoons for filature purposes are required.

The rearers in Bengal have five *bunds* or crops of cocoons in the year, the worms of which spin their cocoons about April, June, September, December and February. From what has been observed of the effects of the seasons, the May-June crop would most probably do much better if the worms reared were to spin early in July instead of June, as the leaf would be of better qualily and the young worms would not suffer so much from the heat in May. The September crop should also be later, and the worms should spin in October, as nearly all races have been found to give good results when spinning in this month.

The *Aughraun bund* which lasts from about the middle of November to the middle of December may come too quickly after the October *bund*, but if tree leaf is used along with bush mulberry leaf the October-December and February crops could be managed and should all give exceedingly good results. The bush leaf could be used along with tree leaf in the September-October rearing and again in the January-February rearing.

Vigour and Climate.—In Bengal the weather conditions influence the rearings to a very great extent. In other countries where one-brooded races are reared only once every year and always at the same time of the year other conditions which influence the rearings are of greater importance than the climate. Most univoltine races are not able to exist under Bengal weather conditions and only a few hybrids are hardy enough to become acclimatised to a certain extent. From innumerable experiments it has been determined that none of the one-brooded races, except the Italian-Japanese hybrid, will live to spin cocoons during the hot weather and rainy season in Bengal, for the worms invariably die of flacherie and gatine just before spinning. The most favourable time of the year for the univoltine Italian-Japanese hybrid was found to be in December and January, the eggs hatching early in December. In this rearing which was made in December 1910 no worms died, the Italian-Japanese hybird also gave very good results when reared during the rains in September 1903. It is not usually realised that a

multivoltine race reared for eight or nine generations during the year has a great strain brought to bear on its constitution, for after two generations when it has been reared under the influence of quite a cool climate, it has to contend with great heat for two months, then heat and humidity during the two following generations, and then back again to a cool season. These changes are very trying for a pure multivoltine race to stand, but it is even more so when a hybrid multivoltine race required for its superior cocoons and silk fibre has to be reared through the varied seasons of Bengal.

Brood characters and climate: univoltine and multivoltine characters produced in the worm stage.—A hybrid race which has been produced from a one-brooded (univoltine) and a many-brooded (multivoltine) strain keeps quite multivoltine during the hot and rainy seasons but tends to become univoltine during the cold season in January and February, if exposed to low temperatures.

During June and July 1919 six layings of the Ramnugger-Madagascar race were kindly reared for me in Darjeeling by Miss B. M. Cooper. From these six layings 955 beautiful cocoons were obtained and they were sent down to Calcutta two or three days after spinning. The worms had spun very thick cocoons at Darjeeling and unfortunately were too weak to emerge properly from such thick cocoons so most of them died without cutting out. Those which managed to cut out and lay eggs were very short-lived and out of about 250 layings there were 29 deeply pigmented univoltine like layings.

The control of this family kept in Calcutta produced small cocoons, but the moths all cut out properly and there were no univoltine-like layings.

This experiment is of interest as it shows—(*a*) that the pigmentation which is so characteristic of the univoltine eggs develops during the worm (larval) stage and not in the egg or moth stage; (*b*) that the superior cocoons spun by worms when reared in the hills could not be used as seed-cocoons in the plains as the moths in the plains are unable to cut out of the thick cocoons they spin in the hills; (*c*) a hybrid race is inclined to become univoltine and lay univoltine eggs which will not hatch when sent down to the plains; (*d*) that worms reared in the hills produce much larger and thicker cocoons than controls of the same families kept in the plains.

Size of cocoon and climate.—The large size and thickness of the shell of the cocoon is apparently a character determined by climatic conditions.

The quality of the silk fibre, however, is not correlated with the size of the cocoon, for the fairly small cocoon of the multivoltine 303 race yields the superior 100-tavelle silk. This quality is evidently an inheritable character not much influenced by climatic conditions.

From some recent experiments it has been found that there are two kinds of superior univoltine types of cocoons, one which appears to be affected by climatic conditions and the other which is as much a characteristic of the variety as the colour of its cocoon.

As far back as 1887 my father, the late Mr. James Cleghorn, had some French imported seed reared at Darjeeling. He kept a control which he reared at Sarda in the Rajshahi district. In his notes he stated "Darjeeling gave better results" the sample cocoons kept which were reared at Sarda weighed 2 grains while the Darjeeling ones weighed from 3 grains to 4½ grains. He also tried an experiment with *Desi* (Chotopolu) cocoons which were sent to Darjeeling in February 1887 and reared there for two generations. The cocoons of the *Desi* were received from Darjeeling in June 1887 and the sample specimens pasted into the note-book weighed 2½ grains. This also gave about 1½ grains more silk than the *Desi* reared at Sarda in the plains.

From these experiments it appears that that hill rearing would be most advantageous when applied to *pure* multivoltine races during the hot and rainy seasons. If the indigenous multivoltine races such as the Nistri and Chotopolu were transferred to the plains only during the cold season they should give much better results and in time the quality of their silk from the manufactures' point of view may also be much improved.

Insular type of climate with equable temperature, most suitable.—Hill rearing, however, is not suitable to hybrid multivoltine races which have been produced from a cross between a one-brooded and many-brooded race. It tends to make these races produced pigmented univoltine eggs which are not suitable for distribution in the plains of Bengal. An equable insular type of climate would be most suitable to such hybrid races where extremes of cold are avoided as well as extremes of heat. If a hybrid multivoltine race was reared under the influence of an equable climate either eggs or seed cocoons could be issued in the plains of Bengal at any time. To take for example such a cross as that produced between the hardy Italian-Japanese hybrid and Nistri race, could be made in January without fear of the eggs reverting to annuals during the February-March rearing if the mean temperature in February was about 67° F. instead of 57° F. Eggs could then be available in March, April, June, July, August, October, November, February and March. Up to the ninth generation this cross has been found to give cocoons from 3·5 grains to over 5 grains in weight, without chrysalis, when reared in the plains, and crops of this cross reared for filature purposes only in the silk districts of Bengal would give a most profitable return.

Equable temperatures, throughout the year in the islands of Madagascar and the Philiphines have been the main factors in producing very superior multivoltine races from univoltine. In Madagascar the mean temperature for January is about 70 F., in Berhampore it is 53°F., at Bogra 52°F, while at Cuttack it is about 60°F. and at Ganjam 62 F.

A place near Cuttack or Ganjam, but not too near the coast, could probably be found which would be very well suited climatically for a seed-distributing base. To quote Mr. Maxwell-Lefroy in the Report on the Silk Industry, when referring to Orissa and

Madras Coast, North—"The area contains hilly country, little opened up, and little known. Much of it would offer extremely good conditions climatically from October to March, some perhaps from June to October, if it is cool enough then". Again when referring to these districts he states :—"There is probably no area of India in which the prospects of sericulture are more deserving of trial and enquiry, particularly in the North".

Silk worm fly.—"Notes on the Natural History of the Bengal Silk worm fly in the Rajshahi District" was published by my father in 1887 and is considered by Watts a "valuable record of a very complete series of observation on the life history of the insect". Further study on the habits of this fly in the silk districts has been much neglected and sericulturists appear resigned to its ravages which result in a very serious monetary loss.

To quote from my father's paper its ravages may be realised as he states :—"There were about 5 kahans (6,400 cocoons); after two days there were only half a pun (40) left. All the rest were fly blown and maggots had cut out".

The silk worm fly maggots have been found remarkably resistant to heat, excessive moisture, kerosine oil, phenyle and even strong ammonia. They are wonderfully agile and elastic being able to squeeze between the flat plaitings of bamboo, of which the rearing trays are made, when ready to pupate. At this stage they invariably shun light and pupate in corners or burrow into crevices. In the fly stage they are attracted by light and fresh air.

I am adding a note to my father's paper (which I hope to have republished) and putting forward some suggestions for trapping the maggots and flies which should help in reducing the numbers considerably.

Mulberry.—Work is being continued on the various varieties of mulberry to be found in India and the detailed descriptions and drawings made are being collected for publication. From a sericultural point of view the following are the chief sub-varieties which have been distinguished :—

1. *Indian Bush Mulberry*, which is cultivated in Bengal. When allowed to grow into a tree it bears small white and pale pink fruit. Is late budding, bears small rather thick dull-surfaced leaves which get easily injured and rot after excessive rainfall. Is the chief variety used for feeding silkworms in Bengal.

2. *Fruiting Mulberry*, which has been obtained from Berhampore, Behar (Arrah) and Kalimpong where it is cultivated for its fruit—Bears purple fruit about one inch to one and a half inches long. Buds early. Leaves rather large, thin and slightly glossy on upper surface. It is the *tut* of the plains, and *chota kimbu* of Kalimpong.

3. *Indian Mulberry from Rumnugger*, which is also cultivated in Bengal for feeding silkworms—Is a very late budding variety, almost as late as the Hungarian variety which is the latest.

4. *Long-leafed Mulberry*, which was found in Ballyganj, Calcutta—Bears only staminate flowers. A very early budding variety. Is the earliest of all the mulberry trees under observation. The leaf, however, fades rather quickly after being plucked.

5. *White fruited Mulberry from Kalimpong*—(Morus alba, Linn ;)—Is the *burra kimbu* of Kalimpong.

6. *Philippine Mulberry*—(*Morus alba*, Linn Var ?)—A Chinese variety said to have been introduced into the Philippines about 1593 and introduced into India about 1840. Buds early at the same time as the Cleghorn mulberry, but after the long-leafed mulberry which is the earliest and which it resembles in having long pointed leaves, and in fading rather quickly after being plucked. Bears both staminate and pistillate flowers on the same branches.

7. *Hungarian Mulberry*—(Morus alba, Linn ; Var ?)—From seed obtained through Messrs. Anderson Wright & Co., and sown in the garden at 57, Ballyganj Circular Road, in October 1908. It is said to be widely cultivated in Hungary by the Government to foster the silk industry. In India it is the last to bud of all the mulberry. Leaves rather thick and glossy and dark coloured. Fruit white. Both staminate and pistillate flower. bearing trees came up from the seed.

8. *Cleghorn Mulberry*—(Morus indica ?)—Obtained from a mutating tree found in Ballyganj. The tree bore staminate (male) and pistillate (female) flowers on separate branches. Cuttings were taken from the male twigs which bore only staminate flowers. The leaves droop and have a long drip-tip and do not get injured in the least after many days of heavy rain. Leaves are thin, smooth and glossy with a waxy cuticle and keep fresher than those of any other mulberry after being gathered. Carefully packed and damped occasionally they have remained crisp and fresh for over three weeks. The leaf also has a sweet taste when compared to that of other mulberry. Buds early coming into leaf at the same time as the Philippine, but a few days after the long-leafed mulberry which is the earliest of all the varieties under investigation.

9. *Chinese Mulberry*—(*Morus rubra*, Lourier)—From China and cultivated in India for its long white and purple fruit. Leaves large and coarse, usually much disliked by silkworms, but the hardy Italian-Japanese hybrid has been successfully reared on the leaf of this variety alone during the months of December and January when unlike, most tree mulberry it is covered with a fair amount of rather old leaf.

10. *Paper Mulberry*—(Bronssonetia papyrifera, Vent.)—It is not a true mulberry. Silkworms feed on the leaves, but do not live to spin cocoons. In Japan and Siam paper is made from the inner bark of this tree. It thrives in Bengal and is easily propagated.

Selection of Mulberry.—From a Sericultural point of view it has been found best to select mulberry from the biological standpoint which makes it suitable for its requirements during the various seasons of the year. Some of the most important points to be observed when selecting mulberry for silk-worm feeding are—(1) the general form of the bush or tree and the character of the foliage ; (2) the nature of the situation and the character of the soil in which it thrives ; (3) the time of the appearance of the leaves, whether early or late, and the time of leaf-fall ; (4) the form of the leaf ; (5) the ability of the young leaves to stand the efforts of drought and hot dry winds, or excessive rainfall ; (6) the nature of the flowers ; (7) the size of the leaf of male and female trees during the flowering season ; (8) best season for propagation by cuttings and the time of seed germination.

Mutation among Mulberry.—From the work completed so far on mulberry to be found in India, it appears that only male trees of the Cleghorn mulberry and the long-leafed mulberry are known, and that no female trees of the three sub-varieties exist, or if they do, they are very rare. The original tree from which the Cleghorn mulberry was obtained bore both staminate and pistillate flowers on separate branches. By cutting the branches immediately below where the staminate and pistillate flowers terminated two male and two female trees were obtained, and these have invariably borne staminate and pistillate flowers respectively. Although the female trees came from the same original tree as the males, they appear to differ in many respects from them and it is most probable that the branch bearing the staminate flowers was in reality a mutation like the nectarine and weeping willow which are classical examples of mutations among plants. Like the mulberry, the weeping willow is easily propagated by cuttings, and only female trees are in cultivation and have become widely distributed.

So far also male trees only of the long-leafed mulberry have been found and only female trees of the small-leafed Berhampore bush mulberry. The trees were probably introduced into India and have been propagated by cuttings only.

The trees of the Berhampore bush mulberry which are all female should have produced some hybrid seedlings which would develop into both male and female trees. It is rather remarkable, however, that no male trees closely resembling the Berhampore bush mulberry have come up from seedlings.

Investigations are being conducted to find out to what extent the progeny of various female mulberry trees vary. A study of the first and second generation hybrids ought to give a clue to the characterstics of the unknown male trees of these sub-varieties. It seems likely that some of the apparent varieties of mulberry are really hybrids.

Manures suitable for Mulberry.—The manures and fertilizers used for the mulberry trees and plants at Alipore and Behala which are cut frequently for leaf during the year, are (1) cowdung, (2) lime, (3) leguminous green manure. At Alipore the trees of Cleghorn mulberry continue to give heavy crops of leaf. They are stripped of leaf at least three times every year and sometimes four. The trees vary in size from six feet in height and are planted ten feet apart, in quincuncial order and have only had a dressing of cowdung and tank-earth in April 1915, and tank-earth again in September 1919. Every October however, grain (*Cicer arientinum, Linn*) is sown rather thickly between all the trees and bushes. and it occupies the ground during the whole cold season.

In the coming cold season some of the rows between the mulberry trees and bushes are to be sown with sunn hemp (*Crotalaria Juncea*) and pizeon pea to see how these very deep-rooted leguminous plants affect the mulberry. Sunn hemp is a quick grower and most useful in choking out weeds.

In August 1919 cowdung was applied to two plots of the Cleghorn mulberry at Behala, and lime to one of three plots of Berhampore bush mulberry which had not given such a good crop as the other two plots. At the end of March 1920 the plot of Berhampore bush mulberry which had been treated with lime was found to have the most luxuriant growth of all the plots of Berhampore bush mulberry, and the bushes of Cleghorn mulberry (cultivated after the Bengal system) were much thicker with larger leaves and were about 8 inches higher than they were last year in March 1919, before the cowdung was applied. These plots have not been irrigated, and it is most probable that the humus, contained in the cowdung which was well dug into the soil, increased the capacity of the soil to retain moisture during the dry season. The dressing of lime which was found very beneficial points to the need of potash in some soils as a manure for mulberry.

TABLE I.

Pedigree of 303 Hybrid Race.

This table gives the generation number of moth and laying date of each elevage and the number of cocoons to each laying in brackets.

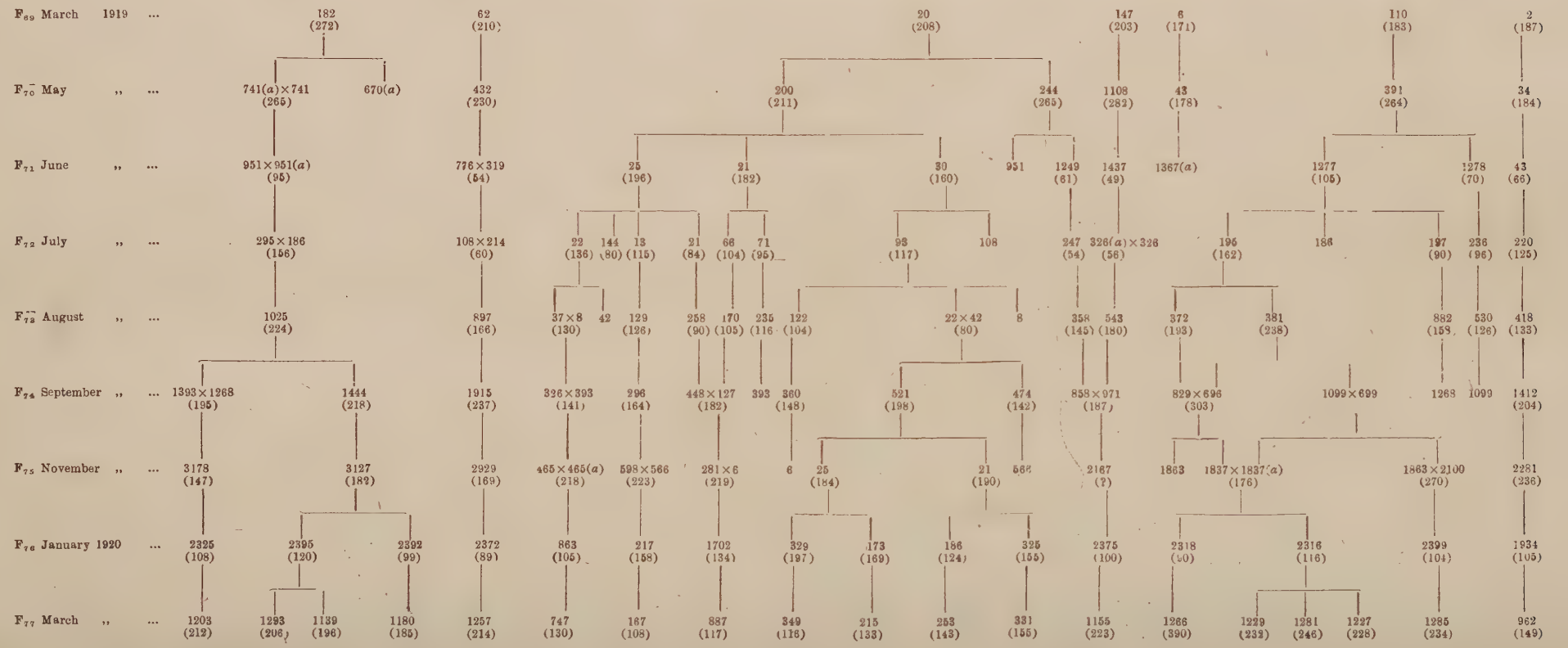
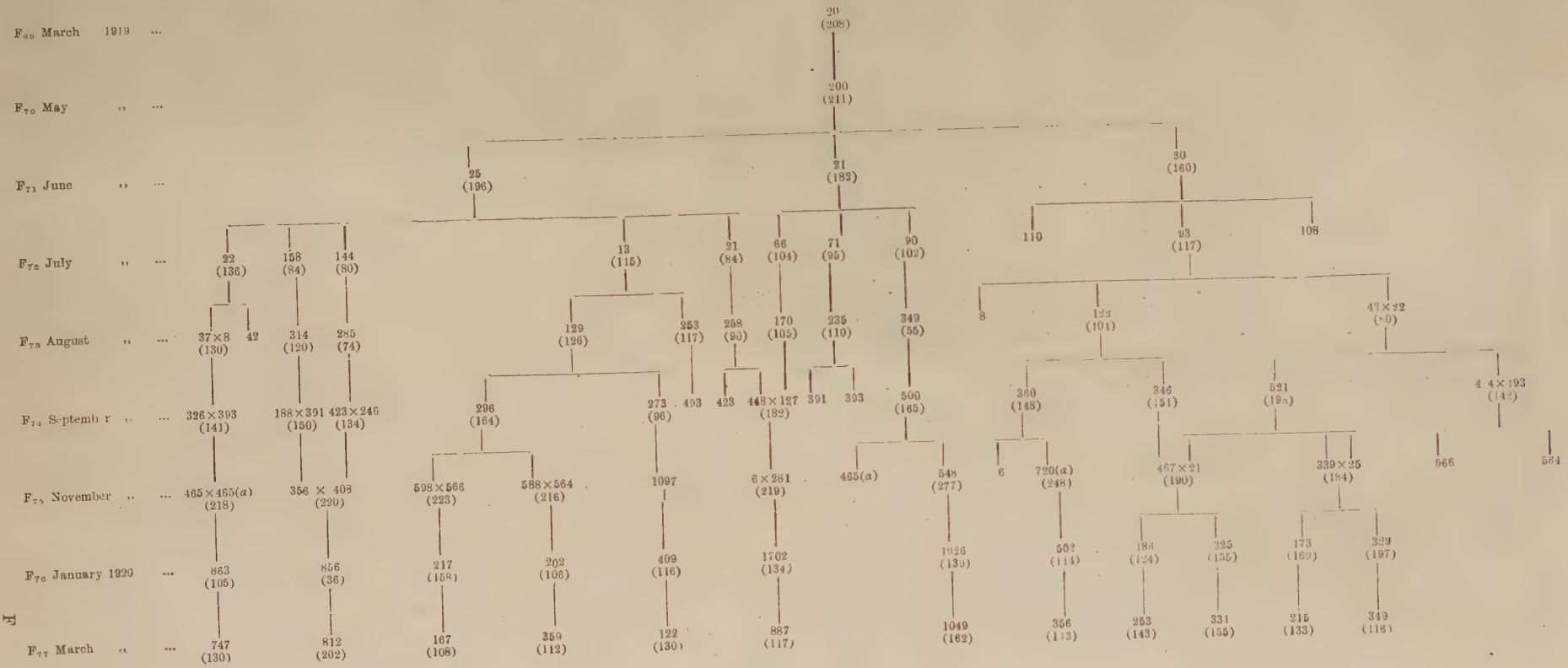


TABLE II.

Pedigree of Hot Weather Group of 303 Hybrid Race.

This table gives the generation, number of moth and laying, date of each elevage and the number of cocoons to each laying in brackets.



APPENDIX XVIII.

REPORT ON THE WORKINGS OF THE SERICULTURAL SCHOOL, RAJSHAHI, FOR THE YEAR 1919-20.

The school was made over to Government in January 1907 ; since then it is being managed by a managing committee under the Director of Agriculture, Bengal.

The school teaches practical methods of—

(*a*) Mulberry cultivation.

(*b*) Microscopic seed selection.

(*c*) Detection and prevention of silkworm diseases.

(*d*) Rearing of silkworms.

The school has in possession 22 bighas of land at Kadirgunj within a mile of the school, of this 17 bighas are under mulberry cultivation.

The cocoons grown in this school are gaining in popularity among the "Bashnis" as these are found to give very good result. They take cocoons from this school for their seed. Four crops of cocoons were raised in this school during the year under report, namely, in May, July, September and January, amounting to 255 kahans of cocoons, of which 12 kahans were kept in the school for miscroscopic examination in the class and the rest was sold to the Bashnis of different joars. The crop for April could not be reared owing to excessive heat in April. The receipt of sale proceeds was Rs. 505 against Rs. 584-8 of the previous year.

Teaching staff.—There is a headmaster who teaches sericulture and with the help of a rearer practical rearing is taught. The headmaster from time to time visited the model rearing houses of passed students and gave instructions to the village Bashnis regarding the rearing of silkworms.

Model nurseries have been started by the *ex*-students of this school and arrangements have been made to inspect the nurseries and to see how they fare by rearing silkworms. There are 44 model nurseries started by passed students of this school. Of these 9 are in Rajshahi and 35 in Malda against 9 in Rajshahi and 35 in Malda of the previous year.

Students.—There were 10 boys in the year under report. All of them appeared at the final examination and passed. They would receive their rewards in next winter. Ten boys of the previous year received rewards of the 1st instalment in the year under report. There are 12 boys on the roll, of whom 6 are Hindus and 6 are Muhammadans.

Microscopes.—There are three microscopes in stock.

Receipts and expenditure of the Rajshahi Sericultural School from 1st April 1919 to 31st March 1920.

Receipts.	Rs.	Expenditure.	Rs.
Sale proceeds	505	Establishment ...	816
Government grant ...	6,505	Stipends	921
		Instruments and appliances	450
Total ...	7,010	Books and maps ...	20
		Petty repairs ...	548
		Petty construction ...	397
		Purchase of furniture ...	48
		Rewards to apprentices ...	1,200
		Rents and taxes ...	145
		Travelling, grain compensation and war allowances ...	129
		Miscellaneous	2,336
		Total ...	7,010

Discipline.—No breach of discipline in connection with the school has come to the notice of the school authorities during the year under report.

Visitors.—The school was visited by—

Hon'ble Mr. J. G. Cumming, Member, Executive Council, Bengal, on the 26th June 1919.

Director of Agriculture, Bengal, on the 10th September 1919.

Ditto ditto, on the 18th November 1919.

Meetings.—The managing committee held four meetings during the year under report.

P. Neogi,

Secretary, Sericultural School, Rajshahi.

GLOSSARY.

Vernacular.	English name.	Scientific name.	Remarks.
Aghani ...	Winter crops.		
Aughraunbund ...	It lasts from about the middle of November to the middle of December for silk crops.		
Aman ...	Winter paddy ...	Oryza sativa.	
Amrita sagar ...	A variety of banana ...	Musa sapientum.	
Arhar ...	Pigeon pea ...	Cajanus indicus.	
Aus ...	Autumn paddy ...	Oryza sativa ...	It is called Ghaiya in Kalimpong district.
Badshabhogh ...	Varieties of paddy ...	Oryza sativa.	
Bhabanibhogh ...			
Betho ...			
Chapalo ...			
Charnock ...			
Dadkhani ...			
Depi ...			
Digha (broadcasted aman).			
Dudsar ...			
Elai ...			
Gangajali ...			
Garia ...			
Gazia ...			
Hatisal ...			
Indrasail ...			
Jasoah ...			
Jatakalma ...			
Jhengasail ...			
Kashiapanja ...			
Kataktara ...			Dhanasi.
Kataribhog ...			Mansara.
Kaminisail ...			Ramtulsi.
Kele ...			Ratomarsi.
Marichbuti ...			Timuray.
Nagra ...			Touli.
Panisail ...			These are the varieties of paddy of the district of Kalimpong.
Sonamail ...			
Samras ...			
Samudrabali ...			
Suryamukhi ...			
Tilakkachari ...			
Bhatmas ...	Soybean	Glysine Hispida ...	It is the Nepali name of soybean, the Lepcha name being Silliyan.
Barind ...	A tract of comparatively high land with a stiff soil of reddish clayey loam which runs through the districts of Rajshahi, Malda, Dinajpur and Bogra.		
Bashnis ...	Bengal silkworm rearers.		
Bigha ...	A bigha is equal to one-third of an acre.		
Bhodes ...	Clayey deposit in old tanks.		
Beel land or bhil ...	.....	.....	Lowlying lands which serves as reservoirs of flood water during the rains.
Bhadoi ...	Autumn crops.		
Bhideshi ...	Foreign, exotic.		
Bogi seed ...	Seed of a variety of jute called Bogi.	Corchorus sp.	

Vernacular.	English name.	Scientific name.	Remarks.
Bunds ...	Seasons for silk crops.		
Bundh ...	An embankment by the side of a river.		
Buri ...	A variety of cotton ...	Gossypium sp.	
Chotopoloo ...	A variety of silkworm ...		
Chhusum ...	Waste silk.		
Dharwar ...	A variety of cotton ...	Ditto.	
Dhaincha ...	.....	Sesbania aculeata.	
Deshi ...	Indigenous.		
Deshi tũñt or tut ...	Mulberry	Morus indica ...	It is called Chota kimbu in Kalimpong district.
Dones ...	An appliance for irrigation.		
Gangajali ...	A variety of wheat ...	Triticum sativum.	
Gur ...	Molasses.		
Gahat or Kulthi ...	Horsegram ...	Delichos Biflorus	Gahat being the Nepali name.
Jhills ...	Small lakes.		
Joars ...	Groups of villages ...	.....	Technical term used in Sericulture.
Joar ...	Sorghum ...	Sorghum vulgare.	
Dukhary ... / Fulgar ... / Sundhia ...	Varieties of millet ...	Ditto ...	It is called kodo in Kalimpong.
Kahan ...	1,280 units make one kahan.		
Katcha ...	Mud built.		
Kalai or matikalai	A variety of pulse ...	Phaseolus radiatus.	
Kharif season ...	Winter season.		
Khesari ...	A variety of pulse ...	Lathyrus sativa.	
Khar ...	Thatching grass.		
Maund ...	It is equal to 82·3 lbs.		
Mashyem ...	A sort of gram ...	Phaseolus calcaratus.	It is a Nepali name.
Mela ...	Fair.		
Mung ...	A variety of pulse ...	Phaseolus Mungo	
Nistari ...	A variety of silk-worm.		
Pucca ...	Brickbuilt.		
Rabi season ...	Spring season.		
Rohit ...	A variety of big fish of the carp species.		
Til ...	Gingelly	Seasamum indicum.	
Ufra ...	An eel worm disease of rice.	Tylenchus sp.	
(i) Dacca Bas ... / (i) Fandak ... / * Hooghly Deshi / (i) Hewti ... / (i) Kakiabomby / (i) Simulkandi ... / * Tosha ...	Varieties of jute ...	(i) Corchorus capsularis. * Corchorus olitorius.	
Bhengi ... / Bispat ... / Hamaku ... / Matihari ... / Naokhol ...	Varieties of tobacco ...	Nicotina tobaccum.	
Gandari ... / Shamsara ... / Khagri ... / Vendamukhi ...	Varieties of sugarcane	Saccharum officinarum.	

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GOVERNMENT OF BENGAL.

REVENUE DEPARTMENT.

Agriculture.

CALCUTTA, THE 30TH DECEMBER 1920.

RESOLUTION—No. 11513 Agri.

READ—

The Report of the Department of Agriculture, Bengal, for the year 1919-20.

MR. R. S. FINLOW, officiated as Director of Agriculture during the year under review from the 13th May, when Mr. S. Milligan went on leave. Mr. K. McLean, Deputy Director, was in charge of the Eastern Circle; and Rai Rajeswar Das Gupta Bahadur, Deputy Director, held charge of the Western Circle in addition to the Northern Circle during Mr. Smith's absence on leave from the former circle. Mr. Hector, the Economic Botanist, officiated as Agricultural Chemist till the 15th December 1919, when he handed over charge of the current duties of these offices to Mr. K. McLean on his appointment as officiating Imperial Economic Botanist at Pusa. The services of Mr. J. N. Chakravarti, Superintendent of Agriculture, were lent to Assam. The permanent strength of the Upper Subordinate Agricultural Service, which includes Farm Superintendents and District Agricultural Officers, was increased from 31 to 33. During the year an important change was made by the formation of a Lower Subordinate Agricultural Service of Demonstrators. Hitherto these officers held merely temporary appointments on Rs. 25 a month. A service has now been constituted on a time-scale of Rs. 30—2/2—50 a month. Eventually there will be one demonstrator in each thana (police-station).

2. The number of students from Bengal at the Agricultural College at Sabour in the province of Bihar and Orissa rose from 32 in the previous year to 43 in the year under review; of these, seven held scholarships awarded by District Boards, three by Government and one by the Education Department. Ten passed the final examination. In the resolution on the working of the department for the previous year it was stated that sanction had been accorded to the establishment of two Agricultural Vernacular Schools, one at Dacca and the other at Chinsura, for the training of the sons of cultivators in improvements in purely practical agriculture. The one at Dacca was opened in January 1920; and the other is expected to be completed in the current year. Help has also been afforded to two secondary schools in the teaching of agriculture. It is true that there has been a considerable recrudescence of public opinion in favour of agricultural education in schools, but the present efforts in this direction are of an experimental nature and the results of the experiments must be awaited before any extension is made by Government on a comprehensive scale. Steps were taken during the year to work out the scheme for the Agricultural Institute at Dacca on the lines recommended by the University Commission and for the acquisition of land for the same. The scheme aims at giving to young men who have already taken a course of pure science a thoroughly practical agricultural education up to the highest standard. Three district farms were opened in Mymensingh, Bogra and Comilla. Preparations are now in progress at different stages for starting similar farms in Birbhum, Bankura, Murshidabad, Faridpur, Bakarganj, Jalpaiguri and the Chittagong Hill Tracts.

3. The results of the research work of the department during the year are interesting in that they reveal that the now classic races, the *kakya Bombai* variety of jute and the *indrasail* variety of paddy, are likely to be

surpassed by other races discovered by a process of selection by the Department. Two strains of *Corchorus capsularis* have now, it is reported, definitely beaten *kakya Bombai.* They are not attacked by the obscure disease known as *chlorosis.* "Chinsura Green," a race of *Corchorus olitorius,* has been found to have an outstanding yielding capacity. A race of winter paddy, *dudsar,* has been discovered, which, it is hoped, will give a slightly better yield than *indrasail* and it ripens slightly earlier. The experiments in using *kataktara,* which is a broadcast highland rice in Eastern Bengal, as an early ripening transplanted rice, were continued with successful results in Western Bengal.

4. During the year under report, 1,812 maunds of *kakya Bombai* seed were sold at cost price, which was often substantially higher than the price paid for local seed. A total of about 4,800 maunds *indrasail* seed was distributed in ten-pound packets on condition that an equivalent amount should be returned after the harvest. There has been little extension of cultivation of this variety of rice, as the cultivators appear to have kept their surplus stocks for consumption and not for seed, but it is reported that the area under *kakya Bombai* was doubled during the year under review. In connection with the question of bringing improved seeds to the notice of cultivators, two statements in the report are of considerable interest. The first is that it seems that the cultivator is beginning to realise that it is worth while to pay a high price for a superior seed; and the second, that he has now got over his former diffidence in accepting advice offered him by the Agricultural Department.

5. The programme of demonstration is not, however, confined to rice and jute. As a result of the work on the Burirhat Farm, cultivators in the neighbourhood have begun to grow Sumatra tobacco; and a Co-operative Sale Society has been formed amongst them in order to enable them to procure the best market for their produce. A keen demand exists for the *tanna* variety of sugarcane, which has been tentatively chosen as the cane most suitable for distribution. On the other hand the results of cotton cultivation are, owing to natural conditions, not encouraging. The demand for bonemeal for transplanted paddy in the Burdwan Division has exceeded the quantity available for supply. The cultivation of ground-nut in the Burdwan Division continues to expand; and demonstrations have been now extended to unfertile high lands in the district of Nadia. Special attention was paid during the year to popularising the cultivation of *rabi* crops in the Rajshahi Division, where 1,800 maunds of seed were sold. The department during the year also rendered valuable services in the distribution by sale or loan of 15,100 maunds of *rabi* seeds in the areas affected by the cyclone of the 24th September. Cattle and fodder investigations at the Rangpur Cattle Farm were rigorously prosecuted during the year under review. Progress was also made in the investigation of diseases.

6. During the year under review an important resolution, No. 631 T.R., dated the 7th June 1919, was published in the *Calcutta Gazette* explaining in some detail certain aspects of the organization and policy of the department. In that resolution the necessity of private effort as an important factor in agricultural development was emphasised and the formation of private agricultural associations of practical agriculturists to that end commended. The present report shows that much satisfactory work on these lines has already been done. There are no less than 87 of such associations in Birbhum and nearly 200 altogether in the Burdwan Division. Over 100 rural associations have been formed in Eastern Bengal, of which there are 53 in Faridpur; there has also been some extension in Northern Bengal. With some exceptions they are doing useful work. In the same resolution a reference was made to one way in which District Boards could co-operate with Government in the development of agriculture, namely, by helping in the establishment of farms; and it is gratifying to note that in addition to the cases of Pabna and Bakarganj mentioned last year, the District Board of Faridpur has come forward with an offer of a site for a farm in that district. Some District Boards are also employing officers of their own to carry out demonstrations of the improved agricultural produce recommended by the Agricultural Department; whilst good work is being done in Government and Court of Wards' estates in popularising the use of improved seed.

7. An important event of the year was the inaugural meeting of the Board of the Agricultural Department opened by His Excellency the Governor on the 18th March 1920, with a speech in which he traced the history of the department and reviewed its successes and potentialities for further success. To it a large number of visitors representative of the country was invited and many questions of practical interest were discussed. The department assisted at a number of agricultural exhibitions during the year. It is under contemplation to have small Government exhibitions annually at each district farm in order to develop a competitive spirit in the raising of good produce by the distribution of prizes.

8. There has been further progress in the development of sericulture during the year under review. The receipts from the sale of Government-examined seeds of silk-worms increased by 35 per cent. Twenty-eight per cent. of the total seed consumed is now reported to be Government-examined seed. It is believed that there has been a substantial expansion of mulberry cultivation on account of the good prices now obtainable for silk. The question of the reorganization of the sericultural branch of the department came under examination during the year; and sanction has been received for the creation of the appointment of a special Deputy Director of Sericulture.

9. As usual the report is a record of continued good work, both in the research and administrative branches. But it is still more encouraging to find it reported that though the department is often subject to hostile criticisms, the public, including the cultivators, are beginning to realise that it can and is doing good to the country. The Governor in Council has, therefore, much pleasure in acknowledging the services of Mr. Finlow, Fibre Expert, for his administration of the Department during the year, and of his assistants and of the public who have helped the Department in many ways. His Excellency in Council also takes this opportunity of expressing his regret at the loss of the services of Mr. S. Milligan, the late Director of Agriculture, on his appointment as Agricultural Adviser to the Government of India and of thanking him for the valuable work he did in Bengal during the time that he held the office of Director of the Agricultural Department.

By order of the Governor in Council,

W. S. HOPKYNS.
Secretary to the Government of Bengal (offg.).

No. 11514.

Copy forwarded to the Director of Agriculture, Bengal, for information.

By order of the Governor in Council,

S. A. LATIF,
Under-Secretary
to the Government of Bengal

Calcutta,
The 30th December 1920.

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